DOC
C 3.23c/2:
2

SMALL-AREA STATISTICS PAPERS
SERIES GE-41, NO. 2

BUSINESS USES OF SMALL-AREA STATISTICS AND EDUCATION'S NEEDS AND METHODS FOR ESTIMATING LOW-INCOME POPULATION

Papers Presented at the Conference on Small-Area Statistics

American Statistical Association
Atlanta, Ga.
August 25, 1975

DEPOSITORY
JUL 12 1976
UNIV. OF ILL. LIBRARY
AT URBANA-CHAMPAIGN

U.S. Department of Commerce
BUREAU OF THE CENSUS

SMALL-AREA STATISTICS PAPERS

SERIES GE-41, NO. 2

BUSINESS USES OF SMALL-AREA STATISTICS AND EDUCATION'S NEEDS AND METHODS FOR ESTIMATING LOW-INCOME POPULATION

Papers Presented at the Conference on Small-Area Statistics

American Statistical Association
Atlanta, Ga.
August 25, 1975

Issued June 1976

U.S. Department of Commerce
Elliot L. Richardson, Secretary

BUREAU OF THE CENSUS
Vincent P. Barabba, Director

BUREAU OF THE CENSUS
Vincent P. Barabba, Director
Robert L. Hagan, Deputy Director
James W. Turbitt, Associate Director for
Administration and Field Operations

GEOGRAPHY DIVISION
Jacob Silver, Chief

LIBRARY OF CONGRESS CATALOGING IN
PUBLICATION DATA

Conference on Small-Area Statistics, Atlanta, 1975.

Business uses of small-area statistics and education's needs and methods for estimating low-income population.

(Small-area statistics papers: Series GE-41; no. 2)

1. United States—Statistical services—Congresses. I. American Statistical Association. II. Title: Business uses of small-area statistics ... III. Series.

HA37.U55C64 1975 001.4'22 76-17810

For sale by Subscriber Services (Publications), Bureau of the Census, Washington, D.C. 20233, or any U.S. Department of Commerce district office. Postage stamps not acceptable; currency submitted at sender's risk. Remittances from foreign countries must be by international money order or by a draft on a U.S. bank. $.90 per copy.

PREFACE

This report contains the papers presented at the Conference on Small-Area Statistics in Atlanta, Ga., on August 25, 1975, during two sessions of the annual meeting of the American Statistical Association (ASA).

General planning of the two sessions was the responsibility of John C. Beresford of DUALabs who is Chairman of the ASA Committee on Small-Area Statistics.

The first session of the 1975 Conference concerned *Business Uses of Small-Area Statistics.* Jonah Otelsberg organized and chaired this session. The speakers were Howard Gitlow, Harvey Smith, and F. F. Colecchia with Irving Roshwalb and Edward J. Spar as discussants.

The second session dealt primarily with *Requirements and Methodology for Intercensal Estimates of the Low-Income Population* as related to the provisions and amendments of the Elementary and Secondary Education Act. The chairman and organizer was Bette Silver Mahoney. The speakers were Alan L. Ginsburg, Wray Smith, and Herman P. Miller with G. E. Alan Dever as discussant.

This report was organized and prepared under the direction of Robert C. Klove, Geographic Research Adviser, Statistical Research Division, Bureau of the Census.


Digitized by the Internet Archive
in 2013

http://archive.org/details/smallareastatist2197unit

CONTENTS

BUSINESS USES OF SMALL-AREA STATISTICS

REQUIREMENTS AND METHODOLOGY FOR INTERCENSAL ESTIMATES OF THE LOW-INCOME POPULATION

Business Uses of Small-Area Statistics

Introduction

Jonah Otelsberg
F.W. Dodge Division
McGraw-Hill Information Systems Company

It is not unusual for people to think that the only suppliers and users of small-area statistics are government agencies. Indeed, most of the past sessions sponsored by the ASA Committee on Small-Area Statistics dealt with small-area statistics as produced and used by government. This year the committee decided to dedicate one of its sessions to Business Use of Small-Area Statistics. We are very fortunate to have practitioners in the field as speakers and suppliers of statistics to industry as discussants.

Professor Gitlow conducted original research to ascertain businesses' need for small-area statistics in making marketing policy decisions. He sent questionnaires to Fortune's 500 and obtained 86 usable replies. From these, he ascertained that most respondents had five or less people dedicated to analysis of external data. The geographical breakdown in which the respondents were most interested were regions, States, counties, and urbanized areas.

Mr. Smith of Vulcan Materials Company and Mr. Colecchia of Westinghouse Electric Corporation share with us their approach to supplying management with estimates of demand for their products. In both papers one is struck by the ingenuity shown by the authors. To provide estimates by sales territories, they both use county data on construction activity obtained from the F. W. Dodge Division of McGraw-Hill Information Systems Company. In order to obtain product estimates, they utilize individual structure information grouped to represent their market. Using statistical methods of various levels of sophistication, insight into their company's business, and imagination, they provide management with the information required.

Such pragmatic approach is practiced by most of the researchers in business who are required to fulfill managements' need for information. They get little support from associations or academic institutions. Both professional associations and academic institutions seem to be fascinated by sophistication in methodology, but ignore problems presented by lack of adequate data. The individual researcher, however, finds it difficult to obtain data that the sophisticated methodologies require. He, therefore, has to improvise to make use of what is available. It is my feeling that in this effort the researcher in business deserves more help from the ASA and schools of business.

We should make an effort to publicize the methods used by various practitioners and provide a forum for discussion of methodology that is applicable to the problem. I hope that this session represents the beginning of such a continuous effort.

Small-Area Statistics: Problems and Prospects for Business

Howard S. Gitlow
City University of New York

INTRODUCTION

Governmental agencies publish mountains of small-area statistics relating to such fields as manpower and labor-force conditions, agriculture, housing, population, business, etc. There is no doubt that a considerable portion of this data is well and widely known, and used by a variety of consumers; e.g., business people, trade unions, governmental agencies, scholars, and special interest groups. Any attempt to survey this enormous spectrum of users of census data would obviously be beyond the resources of a single nonfunded study. Consequently, this study had to select a particular category of data use and user. The area selected for investigation, small-area census data for making marketing-policy decisions, has not received much attention to date. This study surveyed the Fortune 500 companies because, due to their size and sophistication, they are the most likely users of small-area census data for making marketing-policy decisions. The marketing-policy decisions under investigation were product, promotion, selling price, and channel of distribution decisions. Company desires for new and/or more detailed small-area census data were also investigated.

RESEARCH OBJECTIVES

The study concerns itself with the following seven objectives.

Objective 1: Inquiring into how frequently census data are used in making marketing-policy decisions. Marketing-policy decisions are defined as product, promotion, selling price, and channel of distribution decisions.

Objective 2: Inquiring if companies feel that they could make better marketing-policy decisions with tailormade, small-area census data.

Objective 3: For those companies feeling that they could make better marketing-policy decisions with tailormade, small-area census data, inquiring into how much better they feel that their decisions would be.

Objective 4: For those companies feeling that they could make better marketing-policy decisions with tailormade, small-area census data, inquiring into how frequently it would be helpful *and* economical to receive updated small-area census data.

Objective 5: Inquiring into the types of geographical census areas used in making marketing-policy decisions.

Objective 6: Inquiring into the type of geographical census areas for which companies would like new and/or more detailed information in order to make marketing-policy decisions.

Objective 7: Inquiring as to the new and/or more detailed information the companies desire by geographical census areas.

THE SAMPLE DESIGN

The Fortune 500 companies were the frame for the study. All questionnaires were sent to functional titles; either the marketing manager, president, or chairman of the board. Eighty-six questionnaires were usable. The unusable questionnaires were composed of 16 responses stating company policy of not responding to questionnaires, 8 incomplete questionnaires, and 6 questionnaires deemed unusable for miscellaneous reasons. Nonresponse bias was not considered in this study due to financial limitations.

RESPONDENT DEMOGRAPHY

Respondents were categorized by SIC code, the number of persons, and staff days per normal month dealing with data external to the firm. Initially, gross corporate revenue for 1974 and the number of persons employed by the firm were considered to describe the companies; however, they were deemed unimportant because all the companies are extremely large. The data for SIC code, 1974 gross corporate revenue, and number of persons employed by the firm were obtained from the Million Dollar Directory.

SIC code.—Most of the responding companies have multiple SIC codes; hence, there are more SIC codes than respondents. Table 1 shows the breakdown of respondent's SIC codes by the first two digits. Manufacturing is the modal SIC code with 76.0 percent of the respondents having this classification code. Mining is the next most common SIC code with 5.4 percent of the respondents having this code.

Table 1. Respondents by Combined Standard Industrial Classifications

Classification	Number of respondents	Percent
Total	221	100.00
Agriculture, forestry, and fishing	3	1.35
Mining	12	5.42
Construction	5	2.26
Manufacturing	168	76.01
Transportation, communication, electric, gas, and sanitary services	9	4.07
Wholesale and retail	9	4.07
Finance, insurance, and real estate	10	4.52
Services	4	1.85
Other	1	.45

Number of persons per normal month dealing with data external to the firm. Table 2 shows the breakdown of respondents by the number of persons per normal month who are devoted to dealing with data external to the firm. The modal category is zero to five persons with 59.3 percent of the respondents falling into this category. A total of 18.7 percent of

the respondents did not yield information on the number of persons dealing with data external to the firm; either because they could not estimate it, did not know it, or did not answer it.

Table 2. Persons Per Month Dealing With Data External to the Firm

Number of persons	Number of respondents	Percent
Total	86	100.0
0 to 5	51	59.3
6 to 10	15	17.4
11 to 20	2	2.3
Over 20	2	2.3
Can not estimate	3	3.5
Do not know	3	3.5
Did not answer	10	11.7

Number of staff days per normal month dealing with data external to the firm.—Table 3 shows the breakdown of respondents by the number of staff days per normal month devoted to dealing with data external to the firm. The modal category is zero to five with 34.9 percent of the companies falling in this category. A total of 22.1 percent of the respondents did not yield information on the number of days per normal month devoted to dealing with data external to the firm because they could not estimate it, did not know it, did not answer it, or it varied considerably.

Table 3. Staff Days Per Month Dealing With Data External to the Firm

Number of days	Number of respondents	Percent
Total	86	100.00
0 to 5	30	34.88
6 to 10	8	9.30
11 to 15	9	10.47
16 to 20	7	8.14
21 to 30	5	5.81
31 to 50	4	4.65
Over 50	4	4.65
Can not estimate	3	3.49
Do not know	4	4.65
Did not answer	10	11.63
Varies considerably	2	2.33

Summary.—The number of persons and staff days per normal month devoted to dealing with data external to the firm were viewed as alternative measures of the desire of companies to have tailormade, small-area census data with which to make marketing-policy decisions. Since the modal responses for both the number of persons and days per normal month devoted to dealing with data external to the firm are in the zero-to-five category, several conjectures can be made. First, Fortune 500 companies have extremely small staffs working on data external to the firm for making marketing-policy decisions. Most of the external data analysis is done by other departments (e.g., economic analysis department) and fed into the marketing department as internal data. Consequently, the zero-to-five figure is inaccurately reflecting a low desire for small-area census data. Second, companies may desire tailormade census data, but feel that they are too costly to use. Third, firms may not be interested in dealing with data external to the firm for making marketing-policy decisions. Fourth, there may be no need for tailormade census data, but rather for more education on the use of currently available census data. Hopefully, the following discussion of this study's report of findings will improve our insight into the relative merit of the foregoing conjectures.

REPORT OF FINDINGS

Objective 1: Inquiring into how frequently census data are used in making marketing-policy decisions.

The frequency of use for census data in making marketing-policy decisions is as follows: 12.8 percent very frequent users, 46.5 percent frequent users, 30.2 percent infrequent users, and 10.5 percent do not use census data at all. The results indicate that census data are moderately used in making marketing-policy decisions, with 59.3 percent of the respondents using census data either very frequently or frequently.

Objective 2: Inquiring if companies feel that they could make better marketing-policy decisions with tailormade, small-area census data.

Eighty-one responses were made relative to this objective. However, while 49.4 percent felt that they could make better marketing-policy decisions with tailormade, small-area census data, 49.4 percent felt that tailormade, small-area census data would not be of any benefit in making better marketing-policy decisions; and 1.2 percent of the respondents were indecisive. Fortune 500 companies are evenly split in their desires to obtain tailormade, small-area census data.

Objective 3: For those companies feeling that they could make better marketing-policy decisions with tailormade, small-area census data, inquiring into how much better they feel that their decisions would be.

Of the 40 firms responding that tailormade, small-area census data would aid them in making better marketing-policy decisions, 38 responded to objective 3. Only 23.7 percent said they felt tailormade information would help them make *much better* marketing-policy decisions, while 73.6 percent felt that tailormade information would aid them in making *better* marketing-policy decisions.

Objective 4: For those companies feeling they could make better marketing-policy decisions with tailormade, small-area census data, inquiring into how frequently it would be helpful *and* economical to receive updated small-area census data.

Thirty-four responses were received in regard to frequency: 2.9 percent want information every 5 years, 82.5 percent want information every year, 11.7 percent want information quarterly, and 2.9 percent want information monthly. Apparently there is a desire for yearly updates on census information. Perhaps marketing-policy decisionmakers are concerned with information overload.

Table 4. Census Areas Used in Making Marketing-Policy Decisions

Areas	Total	Percent	Type of policy decision			
			Product	Promotion	Distri-bution	Sales price
Total	708	100.0	237	175	247	43
Percent	100.0	(X)	33.5	24.7	34.9	6.9
States	146	20.6	52	39	44	11
Geographic divisions	61	8.6	17	14	23	7
Regions	73	10.3	25	16	26	6
State economic areas (SEA)	13	1.8	4	3	5	1
Economic subregions (ESR)	14	2.0	5	3	5	1
Counties	88	12.4	28	22	34	4
Congressional districts	5	.7	3	1	1	-
School districts	6	.9	1	3	2	-
Special purpose districts	10	1.4	3	3	2	2
Foreign trade statistical areas	35	4.9	14	7	11	3
Wards	-	-	-	-	-	-
Municipalities and townships	13	1.8	5	3	5	-
Minor civil divisions (MCD)	3	.4	1	1	1	-
Census county divisions (CCD)	7	1.0	3	2	2	-
Places	7	1.0	3	1	3	-
Urban-rural areas	16	2.3	6	3	6	1
Urbanized areas (UA)	16	2.3	5	4	6	1
Standard metropolitan statistical areas (SMSA)	113	16.0	39	23	44	7
Standard consolidated areas (SCA)	5	.7	2	2	1	-
Universal area codes (UAC)	-	-	-	-	-	-
Major retail centers (MRC)	19	2.7	5	5	7	2
Central business districts	1	.1	-	1	-	-
Census tracts	16	2.3	4	4	7	1
Standard location areas (SLA)	-	-	-	-	-	-
City blocks	6	.9	3	2	1	-
Enumeration districts (ED)	-	-	-	-	-	-
Block numbering areas (BNA)	-	-	-	-	-	-
ZIP code areas	35	4.9	9	13	11	2

- Represents zero. X Not applicable.

Objective 5: Inquiring into the type of geographical census areas used in making marketing-policy decisions.

Table 4 shows a cross tabulation of small geographical census areas by marketing-policy decisions. Each respondent was to check off as many areas (28 were listed) for each type of policy decision (4 decisions were listed) as are used in making marketing-policy decisions. This accounts for the large number of responses (708). The most common geographical census areas used for making marketing-policy decisions (see table 4) are States (20.6%), standard metropolitan statistical areas (16.0%), and counties (12.4%). Wards, universal area codes, standard location areas, enumeration districts, and block numbering areas are the geographical census areas least used (all had 0 responses).

The policy decisions most commonly aided by census data are distribution (34.9%), product (33.5%), and promotion (24.7%). Selling price decisions (6.9%) are much less frequently aided by the use of census data.

Objective 6: Inquiring into the type of geographical census areas for which companies would like new and/or more detailed information in order to make marketing-policy decisions.

Table 5 shows a cross-tabulation of small geographical census areas by marketing-policy decisions. Each respondent was to check off as many areas (28 were listed) for each type of policy decision (4 decisions were listed) for which new and/or more detailed information was desired for making marketing-policy decisions. Only 257 responses were received in comparison to 708 received in objective 5. This may reflect a feeling that there already exists a profundity of census data. The areas most respondents want new and/or more detailed information about are States (15.2%), standard metropolitan statistical areas (14.8%), and counties (10.1%). Minor civil divisions and enumeration districts (both had 0 responses) are the areas for which new and/or more detailed information is least desired.

Table 5. **Census Areas for Which New or More Detailed Information is Desired**

Areas	Total	Percent	Type of policy decision			
			Product	Promotion	Distribution	Sales price
Total	257	100.0	97	65	75	20
Percent	100.0	(X)	37.7	25.3	29.2	7.8
States	39	15.2	17	9	9	4
Geographic divisions	22	8.6	8	6	5	3
Regions	18	7.0	8	5	3	2
State economic areas (SEA)	2	.8	1	-	1	-
Economic subregions (ESR)	6	2.3	2	1	3	-
Counties	26	10.1	14	4	7	1
Congressional districts	2	.8	1	1	-	-
School districts	1	.4	-	-	1	-
Special purpose districts	3	1.2	1	1	1	-
Foreign trade statistical areas	14	5.4	5	5	3	1
Wards	2	.8	-	1	1	-
Municipalities and townships	4	1.5	1	1	2	-
Minor civil divisions (MCD)	-	-	-	-	-	-
Census county divisions (CCD)	4	1.5	2	1	1	-
Places	2	.8	-	1	1	-
Urban-rural areas	1	.6	1	-	-	-
Urbanized areas (UA)	4	1.5	1	1	1	1
Standard metropolitan statistical areas (SMSA)	38	14.8	15	10	10	3
Standard consolidated areas (SCA)	1	.4	-	-	1	-
Universal area codes (UAC)	1	.4	1	-	-	-
Major retail centers (MRC)	15	5.8	3	5	6	1
Central business districts	1	.4	-	1	-	-
Census tracts	10	3.9	2	2	5	1
Standard location areas (SLA)	1	.4	-	-	1	-
City blocks	3	1.2	1	1	1	-
Enumeration districts (ED)	-	-	-	-	-	-
Block numbering areas (BNA)	3	1.2	1	-	2	-
ZIP code areas	34	3.2	12	9	10	3

- Represents zero. X Not applicable.

The policy decisions for which respondents desire new and/or more detailed census data are distribution decisions (29.2%), product decisions (37.7%), and promotion decisions (25.3%). Since selling price decisions did not rely heavily on census data, there is little desire (7.8%) for new and/or more detailed census data to aid policymakers in this area.

Objective 7: Inquiring as to the new and/or more detailed information the companies desire by geographical census areas.

Table 6 shows the type of new and/or more detailed information desired by census areas. Sixty-eight responses were received in regard to this objective. Of these, 58.8 percent of the respondents wanted new and/or more detailed information on States, counties, and ZIP codes. Of course these are the most commonly known geographical census areas. A total of 59.8 percent of the respondents are interested in the following: More timely information (5.9%), SIC information (11.8%), construction information (7.3%), product and service consumption information (11.8%), population trend information (5.9%), and population characteristics information (16.2%). It is not surprising that demographic data and product and service consumption patterns are the most desired type of information since they are needed by all types of firms.

SUMMARY AND CONCLUSIONS

There appears to be a general lack of enthusiasm for new and/or more detailed small-area census data on the part of business people. This conclusion is based on the following facts:

1. A cleavage of opinion among Fortune 500 companies as to the desirability of tailormade, small-area census data as a basis for making better marketing-policy decisions; i.e. 49.4 percent said that they could make better marketing-policy decisions and 49.4 percent said that they could not make better marketing-policy decisions with tailormade, small-area census data;

2. Among those desiring new and/or more detailed small-area census data, the desire was only for limited geographical

Table 6. New and/or More Detailed Information Desired for Geographical Census Areas

Information desired	Total	Percent	Areas														
			United States	States	Geographic divisions	Regions	Counties	Special purpose districts	Foreign trade statistical areas	Minor civil divisions (MCD)	Places	SMSA's	Major retail centers	Census tracts	Blocks	ZIP codes	Sales territories
Total	68	100.0	4	14	1	3	17	1	3	3	1	5	1	4	1	9	1
Percent	100.0	(X)	5.8	20.6	1.5	4.4	25.0	1.5	4.4	4.4	1.5	7.3	1.5	5.9	1.5	13.2	1.5
More timely information	4	5.8	1	1	-	-	-	-	-	1	-	-	-	1	-	-	-
Already available	4	5.8	1	-	-	-	1	-	-	-	-	1	-	-	-	1	-
Better definition of existing areas	1	1.5	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Everything and anything	1	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
SIC information	8	11.8	1	-	-	-	5	-	-	-	-	1	-	-	-	1	-
Industry volumes	2	2.9	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Production of goods and services	1	1.5	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Interstate shipments	2	2.9	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-
Raw materials consumption	3	4.4	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-
Construction activity	5	7.4	-	4	-	-	1	-	-	-	-	-	-	-	-	-	-
Consumption of goods and services	8	11.8	-	1	1	1	4	-	-	-	-	1	-	-	-	-	-
Population trends	4	5.8	-	2	-	-	-	-	-	1	-	-	-	-	-	1	-
Population demographics	11	16.2	-	2	-	-	3	-	-	1	-	1	-	1	-	2	1
Energy users	1	1.5	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Foreign imports and exports	2	2.9	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-
Detail on owner-occupied homes	3	4.4	-	-	-	-	1	-	-	-	1	-	-	-	1	-	-
Health service planning	2	2.9	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-
Selling prices	1	1.5	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Channels of distribution	1	1.5	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Manufacturing and processing establishment	1	1.5	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Vehicle registration	1	1.5	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Employment	1	1.5	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Population psychographics	1	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-

- Represents zero. X Not applicable.

areas: States, standard metropolitan statistical areas, and counties;

3. The response rate among those desiring new and/or more detailed small-area census data was only 36.3 percent of the response rate currently using small-area census data (257 versus 707); and

4. A low allocation of staff is needed for the analysis of data external to the firm.

Consequently, it seems reasonable to further conclude that the burden of proof for producing more small-area census data, ostensibly for business people to improve their marketing-policy decisions, should be on those arguing for the production of such data. But the matter must not be left as stated to this point.

Speculation that there is much ignorance in regard to the availability and use of small-area census data is appropriate. This speculation is supported in a study by Mindlin.[1] He states in his study of small geographical census areas that there is a need for improved geographic identification and wider knowledge of Federal statistics for small areas. This study supports the speculation that the lack of interest shown for new and/or more detailed small-area census data is a reflection of ignorance. After all, what one does not know, one does not miss. Consequently, education on the availability and use of small-area census data deserves a high priority to reduce the level of ignorance. As ignorance about small-area census data diminishes and decision-makers realize what a powerful tool it could be in making marketing-policy decisions, there may be an increased demand for such data.

Finally, it should be remembered that only business people were surveyed on their desire for new and/or more detailed small-area census data for making marketing-policy decisions. There could be other groups who desire such data; i.e., academicians and governmental groups. These groups may need the data to extend knowledge, so that someday business people may be able to benefit from this greater knowledge. At that point, business people may evidence a more united and coherent demand for new and/or more detailed small-area census data for making marketing-policy decisions.

[1] Mindlin, Albert, "Improvements in Federal Statistical Programs for Small Areas," in U.S. Bureau of the Census, Census Tract Papers, Series GE-40, No. 8, Small-Area Statistics: Strengthening Their Role in Federal Government and Their Use in Criminal Justice Programs, papers presented at the Conference on Small-Area Statistics, American Statistical Association, Ft. Collins, Colo., August 23, 1971; Washington, D.C.: U.S. Government Printing Office, May 1972.

Forecasting Construction Materials Markets by County for 5-Year Planning

Harvey Smith
Vulcan Materials Company, Birmingham, Ala.

Certain construction materials such as stone, sand, and gravel have relatively low value relative to their large volume or weight. Most often they reach their customer destination primarily by truck. Producers and marketers of such materials describe their served markets for single pits or quarries most clearly by naming combinations of cities and counties. These microeconomies provide product demand volume potentials which, when compared to national or regional markets, usually cycle differently from year to year and have different rates of long-term growth.

For tactical and strategic business planning, managers of such low-value, high-bulk commodity businesses find they need to examine historical demand potentials for their product within these served microeconomies. They must also project future product potentials derived from the study of past potentials and research which develops most probable future economic expectations for these small economies. Economic indicators of monthly, quarterly, and annual business variation for single city or county economies are only rarely available to provide clues as to fluctuations in product demand. Useful cyclical demand indicators are never available on a consistent basis across all cities, towns, or villages. For most products, a similar situation exists for county concepts.

Fortunately for construction materials producers, there is a splendid exception at the county level. The F. W. Dodge Division of the McGraw-Hill Information Systems Company has for decades published its monthly estimates of the dollar value of construction contract awards for counties in a very high proportion of all States in the United States. For the construction materials marketer such data can provide the "Open, Sesame" to very localized product-demand estimating and forecasting needs. As an example of the actual use of Dodge data in such context, we describe here the marketing potential information system used by the Nation's largest producer of crushed stone, Vulcan Materials Company. The products with which we shall deal are construction aggregates—meaning crushed stone, sand, gravel, and other mineral substitutes used as construction materials either in loose form or in combination with cements, bitumens, and other binders.

We show in table 1 the type of results we seek to obtain. Here is our recent estimate of the historical and forecast demand for aggregates in Birmingham's Jefferson County, Alabama.

Our information system suggests to us that during 1967-74 we had demand for aggregates ranging from a low of 3,458,000 tons in 1967 to a high of 4,805,000 tons in 1971. We are forecasting a high of 4,599,000 tons in 1980 and a low of 3,301,000 tons in 1975. Note that our forecast is a cyclical one—not one of simple trending of past history.

Examining our various end-use demand sectors in the record year 1971, we see that some 2,090,000 tons of aggregates were used for roadbuilding and maintenance, of which 1,303,000

Table 1. Total Aggregates Consumption and Forecast Demand for Jefferson County, Alabama: 1967 to 1980

(Thousand tons)

Year	Total	Roads			Other public works and private utilities	Buildings	
		Total	New	Maintenance		Residential	Non-residential
	Historical						
1967	3,458	2,061	1,287	774	38	755	604
1968	3,530	1,795	1,018	777	82	797	856
1969	3,791	1,302	522	780	242	684	1,563
1970	3,694	1,004	820	784	121	811	1,158
1971	4,805	2,090	1,303	787	132	1,239	1,344
1972	4,193	1,616	826	790	96	1,467	1,014
1973	4,758	2,276	1,480	796	265	1,167	1,050
1974	3,842	1,690	891	799	326	738	1,088
	Forecast						
1975	3,301	1,550	748	802	145	560	1,046
1976	3,581	1,619	814	805	171	722	1,069
1977	4,275	2,096	1,288	808	140	913	1,126
1978	3,950	1,656	845	811	215	878	1,201
1979	4,488	1,825	1,011	814	285	1,132	1,246
1980	4,599	1,734	917	817	350	1,227	1,288

tons were for new road construction and 787,000 tons for the patching and repair of older roads. Other public works' and private utilities' construction was not extensive and demanded only 132,000 tons of stone. Residential building was strong, demanding 1,239,000 tons; nonresidential was also strong, demanding 1,344,000 tons. We will show you how we develop this historical demand series for Jefferson County, and then how we use the historical data and other forecast indicators to forecast future demand for the county.

The dynamics of demand change, which is excellently revealed in table 1, demonstrates the necessity for creating this market potential information system. The intermix of differing trends and cycles of government-funded construction activities, such as roadbuilding and public works, with consumer-inspired homebuilding and business-inspired nonresidential building suggests it to be wholly illogical to depend upon time series extrapolation such as straight-line trends or compound annual rates in forecasting future market demand. This record shows that it behooves us to recognize the existence of wholly differing cycles among the business opportunities represented by our various end-use construction demand segments.

To develop these data for any county or group of counties, we start out with F. W. Dodge construction award monthly data, broken down for us into four end-use construction areas and separately applying to single counties. We have selected these end-use areas based upon grouping together those areas which have similar content of stone, sand, and gravel per dollar of construction activity. We separately concern ourselves with the roadbuilding sector; with various public works and private utilities such as dams, waterfront work, railroads (which have crushed stone under their tracks called ballast), sewerage, waterworks, and electric utilities; with residential buildings; and with nonresidential building, that is, industrial and commercial buildings, hospitals, schools, etc.

Our first concern is that the F. W. Dodge dates of granting construction contract awards do not represent the dates for shipping the aggregates associated with that construction. Rather, it is the timing of the resulting put-in-place construction schedule which more closely relates to the timing of our aggregates shipments. Our first task, then, is to convert the monthly county construction awards data into a monthly schedule of put-in-place construction. Table 2 shows that we have transformed a series of roadbuilding construction contract award dollars for 1972-74 into what we believe is an approximate put-in-place 1972-74 construction schedule.

Note that the large volume of roadbuilding contract awards in 1972—that is, $48,563,000—when converted to put-in-place seems to have spilled its strength over into 1973-74 activity while having very little lifting effect on put-in-place activity in the year 1972.

To get this conversion from awards to put-in-place, we have equipped our computer with what we refer to as "splay-out patterns." These patterns are simplified versions of standard schedules which are utilized by the U.S. Department of Commerce in constructing national construction put-in-place series from various construction award data supplied to them. However, we are satisfied to have our "splay-out" patterns much simpler than those used by the U.S. Department of Commerce for at least two reasons: First, we developed simplified versions of patterns for ease of hand calculation when we began to exercise this system without the aid of a computer; second, we are much less concerned with resulting "splay-out" effects on providing put-in-place on a month-to-month or quarter-to-quarter basis than we are with the results in the form of total annual data. Small errors in month-to-month and quarter-to-quarter put-in-place "splay-outs" have little effect upon our annual data totals. This is because we make a "building-season" seasonal adjustment which has the effect of placing relatively little percentage of annual construction activity in those wintry months of November, December, January, and February—that is, those months which most affect the placement of business from one year into the next. As an oversimplified description of our "splay-out" patterns, we might say that we splay out roadbuilding construction awards on the average over a period of about 18 months, after several months' lag for a delayed start-up period. Homebuilding awards, on the other hand, we may splay out into the current month and the 6 subsequent months. A pattern for nonresidential construction is suggested in figure 1.

Having converted the dollar construction awards into such schedules of construction put-in-place, we pause to express the latter dollars in terms of constant dollars to remove any tendency for a misleading enlargement in implied aggregates tonnage content due to inflation. The example in table 3 used construction price deflators from the U.S. Department of Commerce, with a 1965 dollar value used as the constant.

Table 2. Construction for Jefferson County, Alabama: 1972 to 1974

(Thousand dollars)

End-use	New construction awards			Put-in-place construction schedule		
	1972	1973	1974	1972	1973	1974
Total	282,761	266,655	230,775	264,063	263,836	238,194
Contract roadbuilding (paving roads, bridges, airports)	48,563	25,884	5,816	13,630	35,921	27,015
Force-account road maintenance	(X)	(X)	(X)	(X)	(X)	(X)
Other public works and private utilities	2,849	22,305	19,960	5,108	13,882	18,805
Residential buildings	147,080	114,813	85,424	151,843	119,273	83,290
Nonresidential buildings	84,269	103,653	119,575	93,482	95,390	109,084

X Contract awards data not applicable.

Figure 1. Method of Estimating Put-In-Place Construction Value From F.W. Dodge Award Data Nonresidential Building

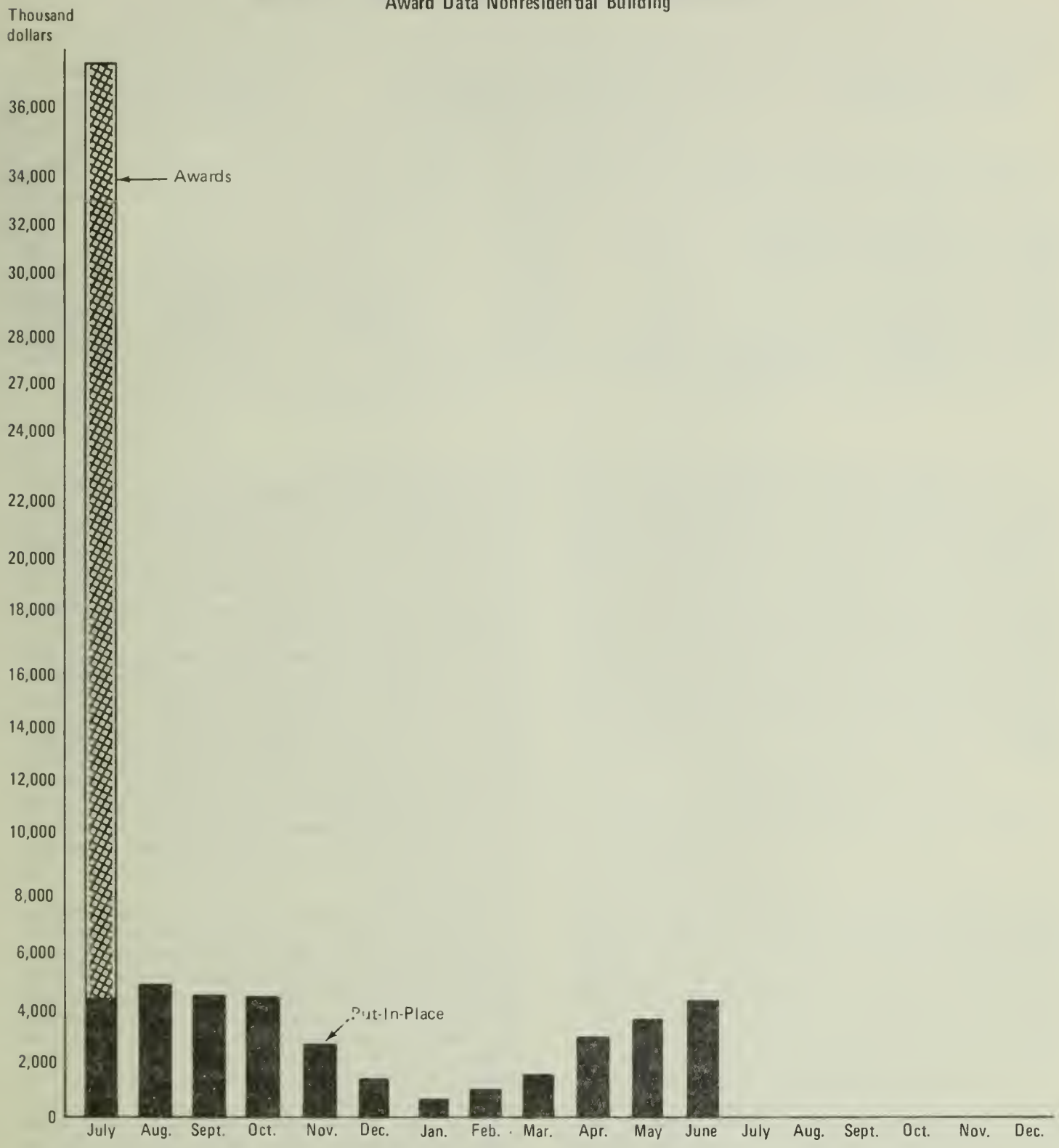


Table 3. **New Construction Awards for Jefferson County, Alabama: 1973 and 1974**

(Thousand dollars)

End-use	New construction awards converted to put-in-place (current dollars)		New construction awards converted to put-in-place (constant dollars)	
	1973	1974	1973	1974
Total	263,836	238,194	159,621	123,861
New roadbuilding	35,291	27,015	21,351	14,048
Force-account road maintenance	(X)	(X)	(X)	(X)
Other public works and private utilities	13,882	18,805	8,398	9,779
Residential buildings	119,273	83,290	72,161	43,311
Nonresidential buildings	95,390	109,084	57,711	56,723

Note: Deflator to 1965 dollars: For 1973, .605; for 1974, .520.
X Contract awards data not applicable.

At this point we apply product-content (usage) factors. These are tonnage per-dollar factors which estimate the volume of stone, sand and gravel, etc., that we should expect to be associated with various types of end-use construction. Building materials lists for particular types of construction provide clues as to such product-content factors. Also, some experience relating to concrete and asphaltic products and aggregates is published by the U.S. Bureau of Labor Statistics and the U.S. Department of Transportation. Implications as to stone, sand, and gravel content can be derived from previously established content factors for associated cement or bitumens. Through long and painstaking scanning of published material, we have narrowed our results to product content factors such as those in table 4.

Table 4. **Product-Content Factors**

End-use	Tons of aggregates per 1965 construction dollar
Roadbuilding, airports	.0680
Other public works and private utilities	.0253
Residential building	.0129
Industrial and commercial building	.0145

Our next step is to apply these product-content factors to convert deflated dollars of construction put-in-place into tonnages of aggregates demand. Working with an $8,398,000 value which has a content factor of .0253, we find that the estimated stone, sand, and gravel associated with public works construction in 1973 is 212,000 tons. In a similar manner, we calculate estimated tonnages of demand associated with the other forms of construction. We are now in a position to arrive at a determination of the final consumption estimates for Jefferson County (table 5).

At this point of time, these tonnage-aggregate numbers exist only in the research data files of the Vulcan Materials Company. There are no data collecting or reporting services compiling the usage of aggregates on a county-by-county basis, and so these figures are entirely the result of marketing research creation—we trust that they are more than a figment of our imagination. However, we do have a checkpoint we can visit which suggests how well we have done in our splaying-out, deflating, and product-content factoring. Because we can develop these figures county-by-county, we certainly can add them together for a total State estimate. At that level, it happens that the U.S. Bureau of Mines does collect and report data on the production (not consumption) of aggregates on a statewide basis. There are data, for example, relating to the production of stone, sand, gravel, etc., in the State of Alabama. We make some calculations against the U.S. Bureau of Mines' data aggregate production figures to remove items which are not related to construction (such as agriculture limestone) and which would, therefore, not be related to Dodge construction awards data. At this point, we could make a comparison of our annual estimates of consumption in Alabama with the annual reported production from the U.S. Bureau of Mines.

However, this would be an inaccurate procedure based on our knowledge of special circumstances such as those which exist in Mississippi where available resources are highly oriented to sand and gravel, thus forcing a great amount of crushed stone to be imported from Alabama and other States. Further, the "condominium boom" in Florida in recent years exhausted local supplies of crushed stone in that State. Material was shipped all the way from Birmingham, Alabama, to Orlando, Florida—an unusual distance, as well as an expensive one—to transport low-value crushed stone.

So, we have to worry about import/export relationships among States affecting any production versus consumption comparisons. The device we use is to combine our estimated tonnage consumption data into one total for as many States as possible. This has the effect of canceling out, in the several States total, many single State differences between production and consumption due to import/export. Table 6 shows us how our Dodge-developed estimates of consumption in nine contiguous Southern States (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia)

Table 5. **Intermediate Step in Estimating Aggregates Consumption in Jefferson County, Alabama: 1973 and 1974**

End-use	Product content factor	New construction awards converted to put-in-place constant dollars (thousand dollars)		Preliminary estimated aggregates volume (thousand tons)	
		1973	1974	1973	1974
Total	(X)	159,621	123,861	4,230	3,376
New roadbuilding	.0680	21,351	14,048	1,454	955
Force account road maintenance	(NA)	(NA)	(NA)	796	799
Other public works and private utilities	.0253	8,398	9,779	212	247
Residential building	.0129	72,161	43,311	931	559
Nonresidential building	.0145	57,711	56,273	837	816

Note: Marketing research estimated tonnage.
NA Contract awards not available.
X Not applicable.

Table 6. **Aggregates Production and Consumption Estimates for Nine Contiguous Southern States: 1967 to 1972**

Item	1967	1968	1969	1970	1971	1972
Production as reported by U.S. Bureau of Mines.....thousands tons..	99,615	112,656	141,551	129,707	154,178	187,799
Consumption as estimated by marketing research (1965 product content factors).....thousands tons..	102,169	112,769	115,269	110,295	127,949	166,047
Product content factor growth adjuster	.975	.999	1.228	1.176	1.205	1.131

Note: Above data is after excluding roadbuilding aggregates usage. Straight-line trend values: Year, 1973--1.254; year, 1974--1.292.
States included are Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Virginia.

compared with production as reported by the U.S. Bureau of Mines.

Our comparison shows us that our estimates of consumption appear high in 1967 and 1968, and appear low in 1969 and 1972. It suggests that we should apply what we now have come to call a product-content-factor growth adjuster to our estimates to bring them into agreement with the production data over the nine States total.

It does not surprise us that we need this final adjustment. The reader will recall that we selected one set of product-content factors which we considered typical of the year 1965. We have made no consideration of the fact that, over time, there may be changing amounts of, say, concrete per construction constant dollar in construction. To take one example, we know that over the years the typical single-family dwelling has expanded its relative usage of concrete. It has moved away from one-car garages toward two-car garages and from one-car-wide driveways toward two-car-wide driveways. It has increasingly added patios and more concrete-lined swimming pools to the property.

There is an existing difficulty in using these State aggregates production series to develop our product-content-factor growth adjuster. The U.S. Bureau of Mines is slow in releasing its annual estimates. For example, we did not, in May of 1975, have the figures we required to calculate the final product-content-factor growth adjustment multipliers for the years 1973 and 1974. We temporarily, estimated these multipliers for the years 1973 and 1974 by using the 1967-72 values for the adjusters and calculating straight-line trend values for 1973 and 1974.

Since the U.S. Department of Transportation provides us with studious clues as to the roadbuilding contract usage content, we apply this corrective multiplier to only the nonroad-building preliminary estimates about which we feel less secure concerning our original estimates. We apply these adjusters as shown in table 7.

Through this method, we now have estimates of the annual consumption of aggregates in Jefferson County, Alabama, resulting from a system of calculation which now produces results that are consistent with U.S. Bureau of Mines production figures totaled over a grouping of nine contiguous States.

Table 7. Estimates of Aggregates Consumption for Jefferson County, Alabama: 1973 and 1974

(Thousand tons)

End-use	Preliminary estimate of aggregates consumption		Finally estimated aggregates consumption[1]	
	1973	1974	1973	1974
Total	4,256	3,356	4,758	3,842
Contract roadbuilding (paving, roads, bridges, airports)	1,480	891	1,480	891
Force account road maintenance	796	799	796	799
Other public works and private utilities	212	253	265	326
Residential buildings	931	571	1,167	738
Nonresidential buildings	837	842	1,050	1,088

Note: Product-content growth adjusters: For 1973, 1.254; for 1974, 1.292.

[1]Corrected for product content growth.

For tactical and strategic planning data needs, it is now our task to forecast future demands for Jefferson County. We turn to our time-sharing computer, in our case tied to the General Electric MAPCAST System, which data bank contains the histories and long-term forecasts of national expectations for construction growth by end-use segment. It may worry the reader to hear our suggestion that we are going to relate the future of Jefferson County, Alabama, to the future of construction for the United States in total. However, we have been finding many statistically acceptable correlations between local homebuilding activity sectors and the total national sector. Often, we also find good relationships between national and local trends in nonresidential building cycles. For an example of good relationship, figure 2 shows how Jefferson County correlated in its tonnage use of aggregates with constant dollar activity in homebuilding at the total national level. The thick line is historical and forecast total residential construction nationwide in 1967 dollar values. The thin line here is tonnage consumption of aggregates for homebuilding, estimated historically by our information system and forecast by simple regression. The R^2 for this county was 0.84; that is, 84 percent of its variance in homebuilding aggregates can be attributed to variance in the national expenditures for homebuilding, a very acceptable fit.

Of course, we have to contemplate the many cases of construction end-use segments for which we do not get good-fitting historical regressions of our county data with the national indicator. Figure 3 compares the movement of tonnage use of aggregates in nonresidential building in Jefferson County with the cycles of nonresidential building in total United States. Our computer has told us here that the correlation coefficient that we obtain from this comparison is only .02, which is wholly unsatisfactory. In such cases, we have to turn to some other device for forecasting tonnage demands for the local construction segment. (Figure 3.)

We interject here that we are exceedingly anxious, for useful planning exercise, to build business cycle expectations into our tactical and strategic planning data. Also, we are looking in each construction segment for some cyclical forecast guide to help us formulate a reasonable assumption as to expectations for each local economy. At present, to our knowledge, the most available guide we have as to what might happen to nonresidential building on a localized basis is the ebb and flow of industry corporate profits. This variable is forecast by General Electric on a national basis and its meaning is incorporated into their national forecast of cycles of nonresidential buildings. Lacking anything other than this national variable to use on the local economy, we attempt somehow to build the feeling of the forecast national variations into our predictions for the local economy.

We have found that for Jefferson County nonresidential building a forecast by simple regression is inappropriate. We retreat to a method similar to approaches we more ancient market researchers used before we had computers to calculate quickly correlations, regressions, etc. Convinced that somehow we must use national projections for nonresidential building as a guide to forecasting the future of aggregates consumption in that sector for Jefferson County, we simply calculate historical annual ratios of tonnage use of aggregates related to nonresidential building in Jefferson County to constant dollars of similar construction activity on the national basis. Figure 4 is a chart of the results of our calculations.

With respect to forecasts in figure 4, we can theorize that drawing a straight line trend through the annual ratios will give us a "ratio trend" prediction as to where the ratio will go in the future. Or, we could also be more conservative and say that we do not believe that drawing such a tend is meaningful but that we should simply calculate the "average ratio" over the period and use this as a means to forecast the future. Or, we can take a "medium ratio" position halfway between what the ratio trend and the average ratio tells us and utilize this for forecasting. As a matter of fact, on our time-sharing computer we have developed an automatic calculation that reveals what the forecast by the use of these various approaches to forecasts of future ratios will yield for us. We make our forecast selection by judgmental selection from such data. By such processes we have developed our forecast for tonnage of aggregate consumption associated with residential and nonresidential building.

In our forecasting effort for local economies, we definitely deny ourselves the use of national indicators in forecasting tonnage of aggregates to be associated with new roadbuilding and road maintenance. There is no logic in assuming that activity in this area will relate at all closely to the total national

Figure 2. Jefferson County Residential Aggregates Consumption Compared to U.S. 1967 Dollars of Residential Construction

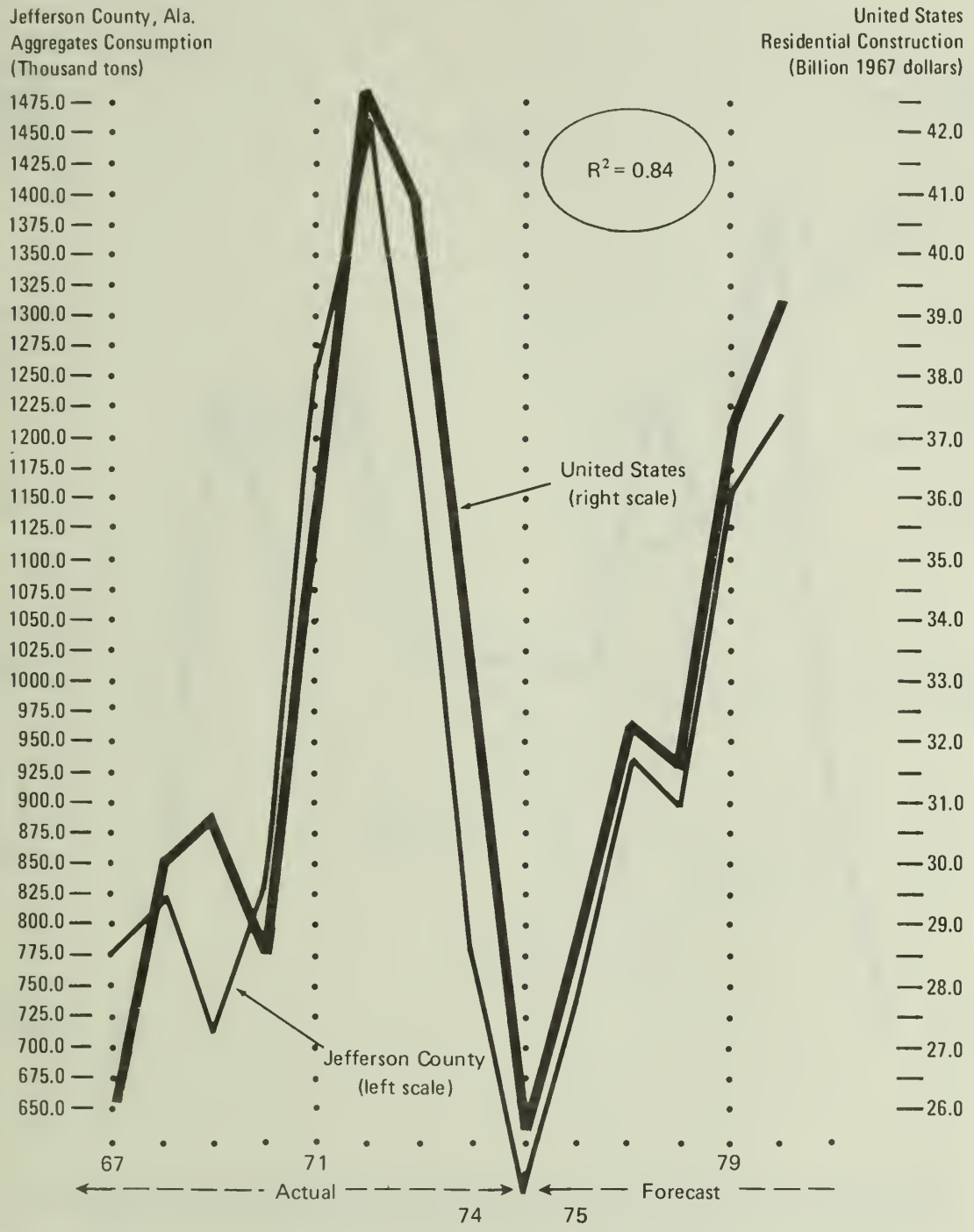


Figure 3. Aggregates Usage in Nonresidential Buildings for Jefferson County, Alabama Versus Construction of Nonresidential Buildings in the United States

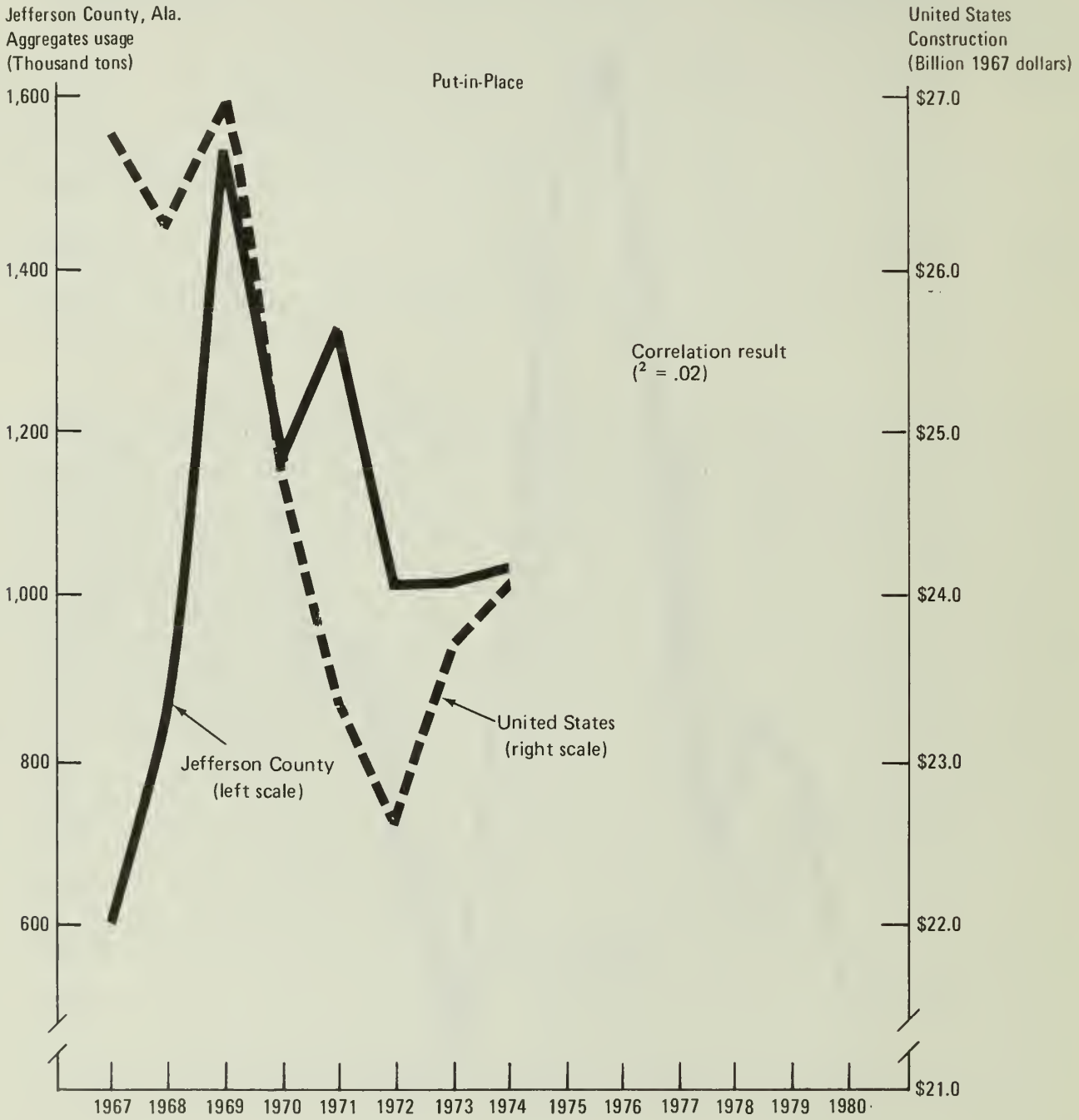
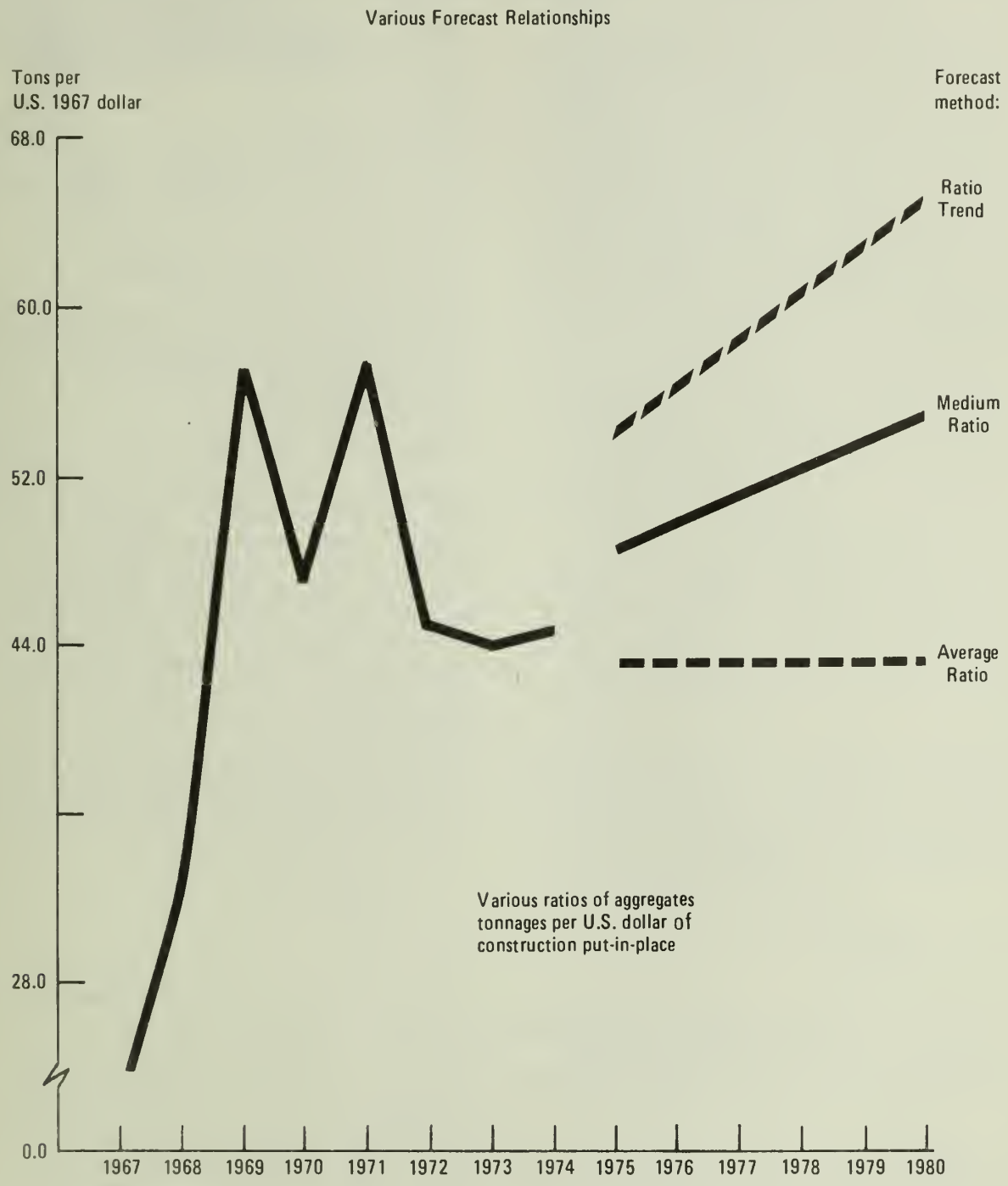


Figure 4. Jefferson County, Alabama Aggregates Usage in Nonresidential Building Construction



roadbuilding cycles. The local roadbuilding situations are very much involved in the annual happenings of politics and elections, taxation, the voting of bond issues, funds availabilities, etc. In this area we insist upon visits to the local roadbuilding authorities to obtain their specific plans for the future. Five-year planning for roadbuilding has become a most common practice, and usually one can go to sources in the State or county and obtain data which represents good guesses as to varying levels of road construction that might be expected in the future relative to the past. The figures used here were obtained as a result of considering existing State, county, and city roadbuilding plans. We also encourage our researchers to use this same field survey approach whenever possible with the other public works and private utilities area, which also is usually found to have a poor correlation between local and national situations.

Finally, we have arrived at the forecast to 1980 for the consumption of aggregates in Jefferson County, Alabama. (See figure 1.) It tells us to expect lackluster activity in the demand for aggregates during 1975-76 but much improved activity in 1977 due to a roadbuilding resurgence. Nevertheless, this dynamic system of forecasting reminds us that we may have to wait many years to revisit the excellent levels of demand for about 4,800,000 tons realized in 1971 and 1973.

Now, armed with these studious information sets on local economies, we can turn forward to tactical and strategic planning for our quarries. Having designated the particular counties to which each of them relate for served markets, we can proceed to make forecasts for tonnage sales expectations for each quarry.

Table 8 refers to a Kingsport, Tennessee, quarry which we find to be related to the economies of three counties: Hawkins and Sullivan Counties (Tennessee) and Scott County (Virginia). The historical and forecast market potential, developed here similarly as we developed it for Jefferson County, is on the first line. On the second line, we indicate the past history of our quarry sales. On the third line, we make a calculation of the ratio of our sales to the market and utilize the 1973-74 average ratio as a device for forecasting our future sales. If there should be additional small sales made out of these three primary market economies, we would add on the next line some small percentage; however, in this case shown there was none to be added.

Our last consideration, of course, is whether the quarry's production capacity is adequate to the sales which might be indicated for the future. In this case, we find that if a maximum level of production of the quarry is assumed to be 1,200,000 tons per year, without the investment of capital with which to expand the quarry, we cannot achieve the sales forecast indicated on the second line. This is a splendid example of the "pay-off" we derive from the use of our information and forecasting system—locating which of our company's 115 construction materials installations may need attention to capital expansion. The computer must manipulate our market potential information system for nearly 300 counties to get answers for all of our establishments.

In conclusion, we emphasize that the development of historical and forecast market potential information systems of this type, to replace what previously was virtually an informational vacuum, is probably the contribution with the most lasting long-term value which a marketing research group can make for any product line. The reader can easily conclude that this system is intensely valuable as a backdrop for long- and short-range planning, for examination of potential stone, sand, and gravel business acquisitions for our company, as a device for examining specific capital expansions which get into several millions of dollars for large quarries, etc. Additionally, we have presented for the student a true case of current small-area market forecasting.

Meanwhile, we hope that some of the deficiencies which are to be noted between the lines of this presentation (deficiencies of local data on product consumption, deficiencies of local forecasts of construction activity sectors, etc.) will be duly noted by those people who might be in a position to develop such services to industry's benefit.

Table 8. Kingsport, Tennessee Quarry Sales and Production Forecast: 1973 to 1978

(Thousand tons)

Item	Historical market			Forecast market		
	1973	1974	1975	1976	1977	1978
Market potential in primary market area-counties: Hawkins, Tennessee; Sullivan, Tennesse; Scott, Virginia...	1,810	1,573	1,841	2,800	2,950	3,570
Quarry sales in primary markets.....	1,162	760	1,035	1,574	1,658	2,006
Primary market share.....	.642	.483	.562	.562	.562	.562
Quarry sale outside primary market.....	-	-	-	-	-	-
Total quarry sales in all markets.....	1,162	760	1,035	1,574	1,658	2,006
Quarry production.....	1,162	760	1,035	(NA)	(NA)	(NA)

- Represents zero.
NA Not available.

Utilizing Small-Area Data to Obtain Product Potentials by Market Segment and Geography

F.F. Colecchia
Westinghouse Electric Corporation

INTRODUCTION

Management is continually faced with the problem of proper identification of their current markets and their share therein, as well as what the future magnitude of these markets is forecast to be for performance and planning purposes. This identification need is fundamental to the planning process done by both the selling organizations and the product manufacturing operations.

This paper will discuss the application of a model developed for the construction market to provide such data for field selling and product manufacturing management. The model covers 13 products from 7 different manufacturing locations, for 21 different construction building categories, by 16 basic field selling geographic areas. The model output provides the current market size by product and geography for the field selling organizations and manufacturing operations and their market shares, as well as product forecasts for the current year and next year. The model is a marriage of statistical theory with market data to provide a practical solution to a marketing problem. Since no trade association or governmental activity identifies these markets specifically, it falls on individual suppliers to develop a means of identifying and forecasting the market.

THE CONCEPT AND ITS DEVELOPMENT

The construction market represents a significant market segment for U.S. manufacturers of electrical equipment. The magnitude of contract awards for construction are annually in the $100 billion area.[1]

Approximately 2 years ago a request was made to the author, then on the Corporate Marketing staff at Westinghouse, from a Westinghouse marketing vice president to develop a way to better evaluate the marketing effort of his organization in the construction industry. The specific request was to develop a means whereby field management could be evaluated on their performance in a given market, as well as provide market information and the share of each product division selling through the construction field sales organization.

Given the broad problem to be solved, the starting point was to contact the appropriate field selling and product manufacturing units to establish feasibility, willingness to participate, and details of the output data they required. After a number of meetings with the interested division and field selling organizations, a matrix was drawn up indicating the specific products on which information was desired. The initial broad product categories selected were as follows:

Motor control centers
General control
Switchboards
Small power transformers
Bus duct
Panelboards
Low voltage switchgear
Large power transformers
High voltage switchgear

Within several of the broad categories, there were subproduct categories.

Recognizing that type of building construction would also affect the desired output, the following building sectors were selected by the users as relevant to the project:

Stores and other mercantile buildings
Warehouses
Parking garages and service stations
Laboratories
School classroom buildings
Government administration buildings
Government service buildings
Amusement, social and recreation buildings
Hotels and motels
Office buildings
Bank buildings
Manufacturing plants
Libraries and museums
Hospitals
Religious buildings
Dormitories
Apartment buildings
Sewage and waste disposal plants
Airport terminal buildings
Water treatment plants
Other nonresidential buildings

Next, an understanding was developed on what was meant by market potential. The following definition was used:

> Market potential is the *maximum demand response* possible for a given *group of customers* within a well-defined *geographic area* for a given *product or service* over a specified *period of time* under well-defined *competitive* and *environmental conditions.*[2]

This definition provided the main ingredients desired by the users (e.g. *specific products* to *given customers* by *geographic area* for a *specified time*). The time aspect was interpreted to be the current as well as future time.

Once the products and building sectors were identified and the definition of market potential agreed upon, the development of the concept was undertaken. The concept developed was to analyze existing orders received through the construction field selling organization for the products identified, and develop "K" factors for product potentials based on contract awards. Contract values and building sectors were secured from the field selling organizations. Geography by State and county was contained on the order. The data were for counties, the

[1] 1975 Dodge/Sweets Construction Outlook, National Estimates, 1975, October, 1974.

[2] Schendel, Dan E., Estimating Market Potential: Established Products, Purdue University.

smallest geographic units used. Selling territories could be analyzed by aggregating the county data to the territory level. Future changes in selling territories could be on a county basis making geography updates easy to accomplish.

Using the product data, contract award, type of building, and geography, the initial work was undertaken on the development of "K" factors. In the initial work, "K" factors were simply the relationship of a particular product on an order to the general contract value for the specific type of building under construction. Simply stated: If an order was received for Motor Control Centers and Bus Duct at values of $10,000 and $20,000 respectively, the "K" factor for Motor Control Centers was 10,000/1,000,000 or .01 percent and the "K" factor for Bus Duct was 20,000/1,000,000 or .02 percent. These values were for the particular type of building in which the product was to be used.

Given the availability of all contract awards for the particular sector of building category and assuming that product potentials developed for us would be representative for the industry, it would be a simple multiplication of the "K" factor times the contract awards to arrive at the total product potential.

Recognizing that all the orders received by us did not represent the total construction market awards, we then determined to identify a suitable data base which would provide consistent, reliable market data on contract awards for the construction industry. An analysis was made of the existing services providing data on the construction industry, and it was determined that the F. W. Dodge Division of McGraw-Hill, Inc., provided us with the best overall data base for our needs. F.W. Dodge data came on a timely basis (monthly) and had sufficient segmentation of building categories to provide us with the specific ones we felt necessary for this project. Further, it was available on tape for ease of use with data processing equipment. Dodge provided us with 267 project types by dollar size and square footage of the contract award. From these 267 categories, we chose the following as having relevancy to our project:

Categories

Building categories	F.W. Dodge structure codes
Stores and other merchantile buildings	001, 002, 004, 101
Warehouses (excluding manufacturing owned)	003, 103, 126, 203, 303
Office buildings	005, 007
Bank buildings	006
Garage and service stations	008, 108
Manufacturing plants	009, 010, 011, 012, 013, 014, 015, 016, 017, 018, 019, 020, 021, 022, 023, 024, 025, 026, 027, 028, 029, 030, 031, 032, 033, 034, 035, 037, 038, 039, 040
School and college classrooms	041, 042, 043, 044, 045, 046, 047, 048, 049
Houses of worship	053
Other religious buildings	054, 055, 102, 253
Amusement, social, recreation buildings	056, 057, 058, 059, 060, 061, 062, 063, 064, 065, 104, 256, 257, 262

Categories—Continued

Building categories	F.W. Dodge structure codes
Airports	068
Hotels and motels	069, 072, 073
Dormitories	074
Apartment buildings	070, 071, 075, 078
Sewage, waste disposal plants	082, 107, 111, 153, 161, 192
Water treatment plants	088
Hospitals and health treatment buildings	093, 094, 095
Government administration buildings	100
Other government, service buildings	050, 051, 052, 105, 109
Laboratories (excluding manufacturing owned)	140
Libraries, museums, etc.	141, 142, 143
Laboratories (manufacturing owned)	809, 810, 811, 812, 813, 814, 815, 816, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 832, 833, 834, 835, 837, 838, 840
Warehouses (manufacturing owned)	909, 910, 911, 912, 913, 914, 915, 916, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 937, 938, 940
Other nonresidential buildings	066, 067, 121, 122, 123, 124, 125, 186, 133, 134, 135, 136, 083, 188, 118, 079

As our analysis of orders by product and building category progressed, we found that the value of the general contract award had an effect on product potentials. Therefore, contract award values were grouped as follows:

0 – $499,999
$500,000 – 999,999
1,000,000 – 1,999,999
2,000,000 – 4,999,999
5,000,000 – 7,999,999
8,000,000 – 9,999,999
10,000,000 and above

Given the above stated criteria of building categories, products, and general contract award sizes, approximately 2,000 orders were analyzed. Over a 2-year period, "K" factors were developed for each of the product categories, by each of the building categories, by each of the contract award groupings. Since building categories did not always have the same mix of products on them, adjustments were made to the data to get more correct "K" factors. After the "K" factor analysis was completed, the next stage of the model development was undertaken.

MODEL DEVELOPMENT

Analysis of the 2,000 plus orders indicated that holes existed in the data when you looked at a product by a building category, by contract award sizes. To solve this problem we went to the mathematics department of our research and

development laboratories for assistance. After discussing the project with them, they developed an approach to solve the problem. The inputs used were (a) the monthly Dodge computer tape that describes in detail all construction contracts awarded that month, (b) the 2,000 plus orders we received in which some of our product was used, and (c) a statistical theory developed by the mathematics department for fitting three-way contingency tables.

It is not the intent of this paper to discuss the statistical theory used in the solution of this problem, but rather, we want to show the application of the derived theory to the practical solution of the marketing problem.

Figure 1 shows the "K" factors developed for a product by building sectors from the 2,000 plus orders analyzed. Note the "holes" that exist in the data. Figure 2 shows the "K" factors developed by the use of three-way contingency tables for the same data used in figure 1. Note that almost all "holes" are filled in. Tables such as those shown in figure 2 were developed for all the products previously identified. The necessary computer programs for the calculations required to develop the final "K" factors were also written. A flow diagram of the "K" factor generator program is shown in figure 3.

Realizing the need for computer systems to help in the final output, a computer model was developed to take the raw data and produce the desired output. Figure 4 shows a flow diagram of the developed computer program.

Utilizing the "K" factor data developed through figure 2 with the programs developed in figure 3 and figure 4, the outputs for the program were developed. The output formats covered two basic areas:

1. Market size and penetration for the field selling organizations by product within geographic areas, and
2. Product market size and penetration by geographic areas for each of the participating product divisions.

Figure 5 shows a typical field report and figure 6 shows a typical division report. The market data was developed from the various product "K" factors multiplied by the contract awards for a given building sector segment, by the contract award sizes, all aggregated to the market total indicated. The report is for one sales district. The sales districts are aggregated to sales zones and the sales zones to a national sales total. The product division report is just the reverse of the field report wherein the divisions product market and penetration are aggregated by geographic areas. The sales data in both cases comes from actual bookings of the products through the field selling organization. The data is run on a quarterly basis with comparisons made to the same period for the prior year.

Forecasts for the current year and next year are also provided through the model. Figure 7 shows a typical forecast output sheet. The forecast can be updated quarterly if desired. The inputs required are simply a percentage change (plus or minus) to the market anticipated for each of the building sectors used. These inputs are then run through the computer program shown in the flow chart in figure 8.

The Dodge tape has a number associated with each contract award. The field people also know this project number when negotiating the order. The Dodge number is now an input on the order form. When an order is received, the Dodge report number is accessed from the tape and the correct structure code, contract award dollars, and geography are developed. "K" factors for the particular order are also derived at that time, reducing much of the manual type work done in the initial model development.

"K" factors are updated on an annual basis. A minimum of 3 years' data are kept for the "K" factor tables. The last year is dropped when the new year is added. Field geography and product updating is made as required, but as a minimum, it is revised at least once a year. The model has capability of the additions of other product lines as required.

SUMMARY

The model described is currently in use by the field and product divisions. The model provides a consistent way for:

1. Developing and measuring performance of both the field and product divisions to the construction market,
2. Establishing sales loadings for field selling organizations, and
3. Forecasting markets for products to the construction industry.

Figure 1. K-Factor Raw Data Report

Type of building	Contract size (thousand dollars)						
	Under $500	$500-$999	$1,000-$1,999	$2,000-$4,999	$5,000-$7,999	$8,000-$9,999	$10,000-$99,999
Stores and other mercantile buildings	.0054506	.0049804	.0053289	(NA)	.0015568	.0013733	.0000110
Warehouse	.0067659	.0040431	.0041841	.0010010	(NA)	(NA)	(NA)
Office buildings	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Bank buildings	.0036364	.0033784	.0031615	.0024251	(NA)	(NA)	.0010487
Parking garages and service stations	.0073529	.0025641	.0006676	.0005003	(NA)	(NA)	(NA)
Manufacturing plants	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Laboratories	.0050676	.0000000	.0000000	.0070493	.0016390	.0009246	.0000000
School classroom buildings	.0051808	.0036261	.0031860	.0022764	.0018269	.0012136	.0011129
Libraries and museums	.0038265	(NA)	.0009009	.0020912	.0017711	(NA)	.0000000
Dormitories	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Hospitals and health treatment buildings	.0069213	.0027133	.0031507	.0032216	.0016447	.0008170	.0011147
Government administration buildings	.0017182	.0031167	.0030400	.0028678	.0021419	.0016689	.0015896
Other government service buildings	(NA)	.0025259	.0036229	.0017437	.0011810	(NA)	.0011126
Religious buildings	.0051282	.0014306	.0000000	(NA)	(NA)	(NA)	(NA)
Amusement, social, and recreation buildings	.0029806	.0005131	(NA)	.0018435	(NA)	.0016709	.0011919
Apartment buildings	.0067114	.0114213	.0017123	.0015269	.0009049	(NA)	.0005679
Hotels and motels	.0161812	.0035682	.0056116	.0021993	.0021199	(NA)	.0005188
Sewage and waste disposal plants	.0013638	.0012827	.0004525	.0003574	.0001531	.0002574	.0000224
Water treatment plants	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Airport terminal buildings	.0087719	.0030090	.0032573	.0022145	.0000000	(NA)	.0013627
Other buildings	.0049764	.0067258	.0025276	(NA)	.0038481	.0007784	.0000641

NA Not available.

Figure 2. K-Factor Algorithm Report

Type of building	Contract size (thousand dollars)						
	Under $500	$500-$999	$1,000-$1,999	$2,000-$4,999	$5,000-$7,999	$8,000-$9,999	$10,000-$99,999
Stores and other mercantile buildings	.0003668	.0002094	.0004252	.0004202	.0004299	.0002418	.0002115
Warehouses	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Office buildings	.0020307	.0011599	.0023530	.0023257	.0023793	.0013395	.0011718
Bank buildings	.0019105	.0010912	.0022138	.0021880	.0022385	.0012602	.0011023
Parking garages and service stations	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Manufacturing plants	.0015954	.0009111	.0018488	.0018273	.0018694	.0010522	.0009204
Laboratories	.0003763	.0002148	.0004362	.0004311	.0004411	.0002481	.0002170
School classroom buildings	.0007931	.0004527	.0009191	.0009084	(NA)	.0005229	.0006574
Libraries and museums	.0005831	.0003328	.0006758	.0006679	.0006833	.0003844	.0003362
Dormitories	.0018476	(NA)	.0021409	.0021160	.0021648	.0012187	.0010660
Hospitals and health treatment buildings	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Government administration buildings	.0019775	.0011295	.0022914	.0022648	.0023170	.0013044	.0011410
Other government service buildings	.0003284	.0001874	.0003806	.0003762	.0003849	.0002165	.0001893
Religious buildings	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Amusement, social, and recreation buildings	.0021091	.0012046	.0024438	.0024153	.0024710	.0013913	.0012170
Apartment buildings	.0029837	.0017048	.0134567	.0034165	.0034952	.0019688	.0017223
Hotels and motels	.0004770	.0002723	.0005528	.0005464	(NA)	.0003145	.0002750
Sewage and waste disposal plants	.0001276	.0000728	.0001479	.0001462	.0001495	.0000841	.0000736
Water treatment plants	.0002491	(NA)	.0002888	.0002854	.0002920	.0001642	.0001436
Airport terminal buildings	.0003526	.0002012	.0004086	.0004039	.0004132	.0002324	(NA)
Other buildings	.0003378	.0001928	.0003916	(NA)	.0003959	.0002227	.0001948

NA Not available.

Figure 3. K-Factor Generator

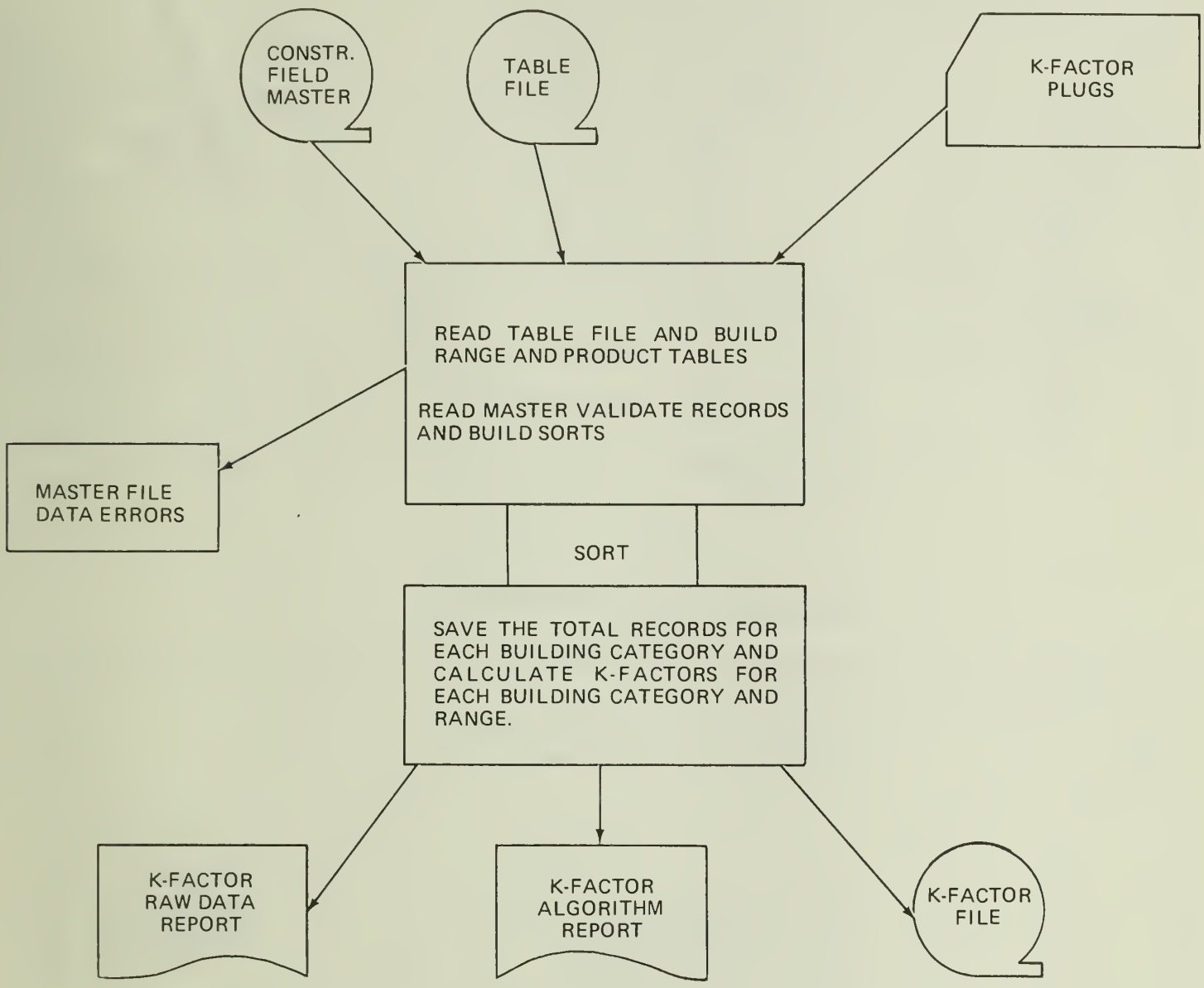


Figure 4. **Market Penetration Report**

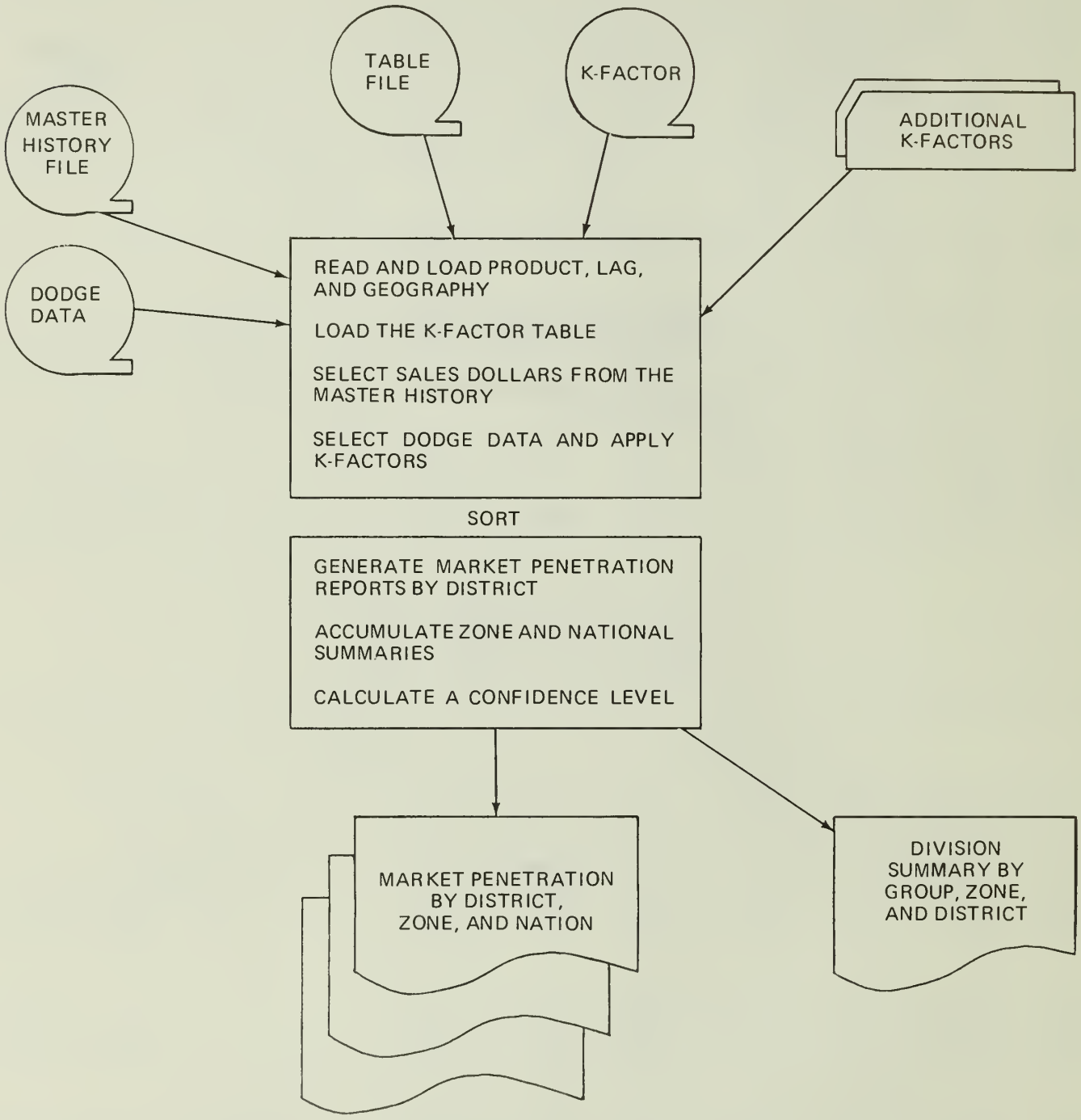


Figure 5. Construction Market Penetration for Northeastern Districts

(Thousand dollars)

Product	Current year (period ending December 1974)			Prior year (period ending December 1973)		
	Market	Sales	Percent market penetration	Market	Sales	Percent market penetration
TOTAL	32,635	(D)	(D)	37,841	(D)	(D)
Motor control centers	3,280	(D)	(D)	3,503	(D)	(D)
General control	1,051	(D)	(D)	1,048	(D)	(D)
Bus duct	4,111	(D)	(D)	5,110	(D)	(D)
Panelboards	7,344	(D)	(D)	8,325	(D)	(D)
Switchboards	7,153	(D)	(D)	8,297	(D)	(D)
Power assemblies	2,233	(D)	(D)	2,880	(D)	(D)
Switchgear-Cincinnati plant	834	(D)	(D)	966	(D)	(D)
Dry-type transformers-Greenville	706	(D)	(D)	798	(D)	(D)
Small dry-type transformers-Sharon	2,231	(D)	(D)	2,543	(D)	(D)
Power transformers S Boston	1,054	(D)	(D)	1,217	(D)	(D)
Large dry-type transformers-Sharon	724	(D)	(D)	862	(D)	(D)
Power transformers-all other	889	(D)	(D)	939	(D)	(D)
Switchgear assemblies	1,025	(D)	(D)	1,353	(D)	(D)

D Data withheld to avoid disclosure.

Figure 6. Construction Market Penetration by Zone and District

(Thousand dollars)

Zone	District	Current year (period ending December 1974)			Prior year (period ending December 1973)		
		Market	Sales	Percent market penetration	Market	Sales	Percent market penetration
	TOTAL	49,924	(D)	(D)	44,804	(D)	(D)
	Total, Eastern	12,339	(D)	(D)	11,898	(D)	(D)
91-1	Northeastern	3,280	(D)	(D)	3,503	(D)	(D)
91-2	New York City	3,640	(D)	(D)	3,901	(D)	(D)
91-3	Atlantic	3,265	(D)	(D)	2,721	(D)	(D)
91-5	Washington	2,154	(D)	(D)	1,773	(D)	(D)
	Total, Northern	17,015	(D)	(D)	14,074	(D)	(D)
92-1	East Central	3,255	(D)	(D)	2,595	(D)	(D)
92-2	North Central	3,603	(D)	(D)	2,421	(D)	(D)
92-3	West Central	3,179	(D)	(D)	3,211	(D)	(D)
92-4	Midland	4,854	(D)	(D)	3,764	(D)	(D)
92-5	North Midwest	2,124	(D)	(D)	2,083	(D)	(D)
	Total, Southern	12,047	(D)	(D)	11,042	(D)	(D)
93-1	Gulf States	3,793	(D)	(D)	3,420	(D)	(D)
93-2	Piedmont	2,798	(D)	(D)	2,464	(D)	(D)
93-3	Florida	3,400	(D)	(D)	3,246	(D)	(D)
93-5	Southwest	2,056	(D)	(D)	1,912	(D)	(D)
	Total, Western	8,523	(D)	(D)	7,790	(D)	(D)
94-1	North Pacific	3,258	(D)	(D)	2,774	(D)	(D)
94-2	Mid-Pacific	1,994	(D)	(D)	1,701	(D)	(D)
94-3	South Pacific	3,271	(D)	(D)	3,315	(D)	(D)

D Data withheld to avoid disclosure.

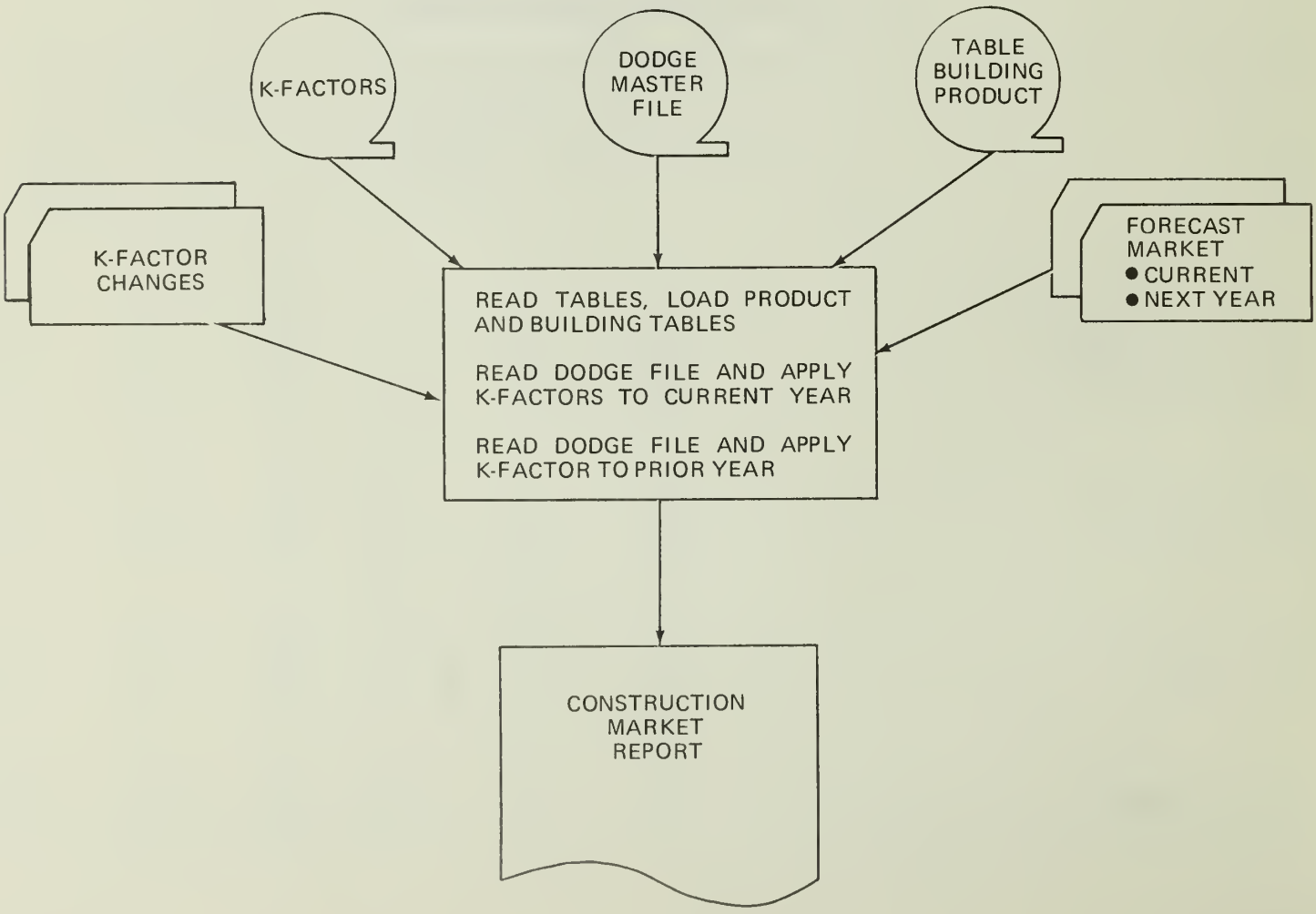
Figure 7. **Construction Market Forecast**

(Thousand dollars)

Product	Prior year market (actual)	Current year market (annualized)	Current year market forecast	Next year market forecast
Motor control centers	51,243	32,308	37,079	(NA)
General control-miscellaneous products	15,497	10,042	13,383	(NA)
Bus duct	73,626	32,664	28,245	(NA)
Panelboards	38,346	70,836	52,557	(NA)
Switchboards	25,473	62,742	53,067	(NA)
Power assemblies	38,470	22,633	20,026	(NA)
Switchgear-Cincinnati plant	14,309	9,083	11,554	(NA)
Dry-type transfomers-Greenville	14,268	7,304	10,025	(NA)
Dry-type transformers-Sharon	42,451	22,636	25,307	(NA)
Power center transformers	17,181	11,536	14,437	(NA)
Power center transformers	12,657	8,110	10,161	(NA)
Power transformers-all other	15,515	8,727	12,038	(NA)
Metal clad switchgear	17,517	11,790	14,912	(NA)

NA Not available.

Figure 8. **Construction Market Report**



Comments

Irving Roshwalb
Audits & Surveys Company, Inc.

Professor Gitlow's paper is of special interest. The growing complexity of the census schedules and the increasing volume of data produced by the Census Bureau have raised questions in many quarters on the need for such volume and detail. The situation calls for some careful investigation of this need. There have been some efforts in this direction and Professor Gitlow's paper is an addition to this development. For example, the Census Advisory Committee on Small Areas reported in the minutes of its November 1974 meeting that the Census Bureau had conducted a pilot study on the uses of census data in the business sector. In fact, at that time the Census Bureau was planning to go to the Office of Management and Budget (OMB) for approval of a more extensive study among three types of businesses: Market research firms, food processors representing large firms, and furniture and appliance stores representing small firms.

The ASA Committee on Small-Area Statistics has established a subcommittee to investigate the feasibility of a program to survey subscribers to small-area data to determine what data are used, for what purposes, and what data are missing. This paper is a real expression of such interest. I would hope that groups with greater resources would conduct studies on the same subject, more extensively and rigorously.

The sweeping generalization of a major finding that there appears "to be a general lack of enthusiasm for new and or/more detailed small-area census data on the part of business people" leaves one breathless—for the following reasons:

1. The universe is Fortune 500.
2. The respondents are vaguely defined—as marketing manager, or president, or chairman of the board. It is a worthwhile hypothesis that sales managers, sales analysts, advertising managers, market research directors may know at least as much as those mentioned earlier about the use of census data.
3. Only 17.2 percent of the companies contacted responded; the nonresponse rate was 82.8 percent.

In listing conjectures to explain the finding that the number of people and the number of days devoted to the use of external data are very low, several conjectures should perhaps be stressed or added. First, how adept is the respondent at recognizing that he is dealing with census data? Second, how much time and how many people *should* be devoted to dealing with census data? How does one set norms for such activity? Perhaps a little is enough.

Researching this market for census data is a very difficult problem, and I think Professor Gitlow is to be commended for taking his step and sharing the findings with us. I would also hope the Census Bureau, the National Science Foundation (NSF), or some other interested group, with much greater resources, would sponsor the kind of work that should be done to make census statistics as responsive as possible to various consumer groups.

Both Mr. Colecchia's and Mr. Smith's papers are interesting examples of the ingenuity that staff people are often required to display in preparing the underpinnings for management decisionmaking. A statistician's training is precise and deals with survey design and experimental methods. But how do you deal with the real problems of analysis that don't fall into any neat compartment, and instead are solved by the statistician's insight and unique familiarity with the problems of his industry? My regret in reading these two papers was that more of that ingenuity was not reported. For example, there are references in Colecchia's paper to the "holes" that exist in the data when you look at such a large matrix of "a product by building category, by contract award size." The statistical approach is never discussed or described. Yet, this problem of zero-cells or holes is one many of us face in creating estimates for small areas. In addition, comments by Colecchia and Smith on the way their forecasts were received by the sales and marketing staffs of their companies, and what role they played in the necessary decisionmaking would be interesting. In other words, how valid did the estimates turn out to be, and how useful were they found to be?

One final comment on Colecchia's paper: Reading it brought a small shock. My general fix on the concept of small-area data is census-oriented—counties blocks, congressional districts, enumeration districts—with the Census Bureau the supplier of the bulk of the required input. This paper does not report on the use of any census data, but deals with company information and F.W. Dodge reports. We do tend to forget that there are non-census sources of small-area data, and that one way to slow the growth of the ever-growing mountain of data produced by the Federal government may be to leave the collection of some of it to nongovernmental sources.

Comments

Edward J. Spar
Market Statistics

Professor Gitlow has drawn some wide and general conclusions from a very small sample of businessmen. He would have us believe that demography is only marginally important to businessmen for marketing decisions. I would feel a little more comfortable with this if there was a larger (n=86) sample, and if we knew for sure that those sampled were directly tied to the marketing analysis function. The basic problems that have to be factored in are that many businessmen (1) do not know how to use census data, and (2) do not know what exists. My own experience with marketing analysts leads me to believe that they are anxious for anything new or more detailed that will help them get a better feel for the marketplace.

I do agree that most analysts want county, metropolitan area, or State data. I think this is true due to that fact that there is no updated information at the subcounty level.

Mr. Colecchia has taken a "nuts and bolts" approach to solve a basic marketing problem: What is my potential? He has combined sales history with the overall outside world as documented in the Dodge reports. I, in general, agree that a good way of setting plans for the future can be accomplished by analyzing the past. Since management knows what they want from the bottom line, a fine way of allocating this can come from known historic distributions. This is a standard way of setting quota.

I would suggest that the technique here can be improved upon with the inclusion of both time series analysis and regression analysis. Independent forecasting of product group sales might refine the estimates. Also, it would be interesting to correlate the Westinghouse data with Dodge data on a subregional basis. When dealing with allocations of this magnitude, such fine-tuners can be very powerful.

Mr. Smith takes us through an interesting time series analysis of a county. He raises crucial questions regarding regression analysis. Is there enough data? Are the high costs involved in using regression worth it? Does it yield better results than simple allocation models. The analyses shown do not resolve this issue. However, since it is crucial to analyze this segment of the construction market on a county by county basis, regression does seem to have the best potential.

Requirements and Methodology for Intercensal Estimates of the Low-Income Population

Introduction

Bette Silver Mahoney
Department of Health, Education, and Welfare

Three related papers were presented and discussed at this session. Each has a connection with title I of the Elementary and Secondary Education Act and the Education Amendments of 1974.

The first paper was prepared by Alan Ginsburg and Charles Cooke, both on the staff of the Office of the Secretary, Department of Health, Education, and Welfare. Their paper is titled "Education's Need for Small-Area Low-Income Data with Reference to Title I, Elementary and Secondary Education Act." This paper describes the need for small-area data by the Federal Government for distributing title I funds. It also describes some of the alternative formulas which were examined during the Congressional deliberations prior to the enactment of the Education Amendments of 1974.

The second paper, by Wray Smith, is based on his current involvement at the Department of Health, Education, and Welfare in statistical operations and census projects, both national and regional. His paper, titled "Collection and Use of State and Local Socioeconomic Data," describes some developments in the Federal regions for increasing consultation and assistance to State and local officials in their utilization of statistical resources. He relates this development to a new survey which is mandated under the Education Amendments of 1974, and which will be of great potential value to State and local analysts and decisionmakers.

The third paper is by Abdul Khan, Senior Policy Analyst in the Office of the Assistant Secretary of Education Department of Health, Education, and Welfare, and Herman P. Miller, consultant to that office. Their paper, titled "Methodology for Estimating the Number of Children in Poverty for States and Counties," describes the methodologies they are experimenting with to meet the requirements described in the Ginsburg-Cooke paper. Their procedures are designed to complement the State-by-State survey described in the Smith paper so that estimates can be made for sub-State areas.

Finally, the papers are discussed by Allan Dever of the Georgia Department of Human Resources. Dr. Dever brings the perspective of a Health Care Systems Analyst from a State agency to these Federal activities in education.

Education's Need for Small-Area Low-Income Data With Reference to Title I, Elementary and Secondary Education Act*

Alan L. Ginsburg and Charles Cooke
Department of Health, Education, and Welfare

INTRODUCTION

Of all the users of small-area data on low-income populations, education is generally not considered an important or major one. But at the Federal level, the need is crucial. This paper attempts to describe that need, how it has been met in the past 10 years, and some of the steps that have been taken to improve the effectiveness of the data for Federal purposes.

The requirement stems principally from the importance attached at the Federal level to the objective of providing equal educational opportunity for all children. Although the Federal Government provides less than 10 percent of the Nation's total educational revenues, it plays a central role in the move to equalize educational opportunities for particular population groups. Some of these funds go to help improve the education of the handicapped or of those whose family speaks a language other than English. But the bulk of the money—some $2 billion this year—is allocated to provide supplementary school services to the educationally disadvantaged through title I of the Elementary and Secondary Education Act. The discussion in this paper is directed primarily to this act.

It is well documented that a student's performance in school is significantly correlated with his family's situation—and in particular with its economic status.[1] Speaking more carefully, it has been shown that children from families at low levels of income suffer a disadvantage in school that is out of proportion to the population at large. Of course, we all know that children from many walks of life often share such a disadvantage. But children from wealthier homes at least have the resources to provide them special assistance that may get them back on the educational track. Children from low-income homes not only lack the family resources to pay for extra educational assistance, but often suffer from lower parental involvement in education.[2] Finally, school districts in which there are concentrations of such disadvantaged children may be less able than other districts to provide, from local funds, the extra services these children require.[3]

For all these reasons, the low-income pupil is a priority Federal target. This paper concentrates on how this general concern is translated into a quantitative formula that permits implementation at the local level. The second section discusses the reasons for the failure of the formula in the original act of 1965, particularly its failure to maintain currency. The next section examines the process of reform and the results that emerged from joint consideration of policy needs and data requirements. Finally, the fourth section explores educational requirements for low-income data in addition to those derived from the program for the disadvantaged that constitutes the primary topic of this paper.

THE 1965 FORMULA

The Elementary and Secondary Education Act of 1965 was a major thrust toward the goal of helping the educationally disadvantaged population. We will be concerned here with part A of title I, through which more than 90 percent of the act's funds are allocated by formula to State governments.[4] The allocation is based on the number of a State's low-income children, modified by a payment rate that reflects a State's average school expenditure per child. The formula embedded in the act calculates not only the share for each of the States but also each State's allocation down to the county level. Since the formula employs census data, which is generally available only to the county level, allocations to school districts that are subparts of counties are calculated by the State governments.

Under the 1965 formula, the number of economically disadvantaged children eligible for the title I program was defined as the sum of two groups:[5]

> Children of school age (5 to 17) from families with income of less than $2,000 according to the 1960 census, and
>
> Children from families in the program of Aid to Families with Dependent Children (AFDC) whose payments from the program exceeded $2,000.

This formulation suffered from its failure to maintain currency. For one thing, although the Federal Government recomputes the title I allocations each year, only one of the two components can be updated. The AFDC component is updated; the census-related figure remains uncorrected until the next decennial census. For another, there was no provision for updating the $2,000 threshold. This had a dual effect: The

---

*This paper reflects the views of the authors and does not necessarily represent the policy of the U.S. Department of Health, Education, and Welfare.

[1] One recent study found correlations of from 50 to 60 percent between low family income of a child and the child's low scores on standardized achievement tests. Another study found that of all children coming from homes with incomes below $3,000, some 45 percent were identified by their teachers as having persistent reading problems (1970 Elementary and Secondary School Survey of the U.S. Office of Education Special Tabulation).

[2] See for example, Hill, C.R. and F.P. Stafford, "Family Background and Lifetime Earnings," paper presented to a National Bureau of Economic Research Conference on Income and Wealth, 1974.

[3] The many low-income children in center-city school districts would appear to be an exception, since these districts have a relatively high tax base per pupil. Center cities, however, must fund high levels of noneducational public services that diminish the tax base actually available to support education.

[4] Part B allocates additional funds to those school districts in which there are very large concentrations of low-income families in recognition that greater supplementary services (per pupil) may be necessary in such areas. Part C allocates additional funds to those States that already exert a tax effort for public education higher than the average national effort.

[5] The formula also counts the children in State institutions for neglected and delinquent children. This group of children is not germane to the present discussion, since family income is not a criterion for their eligibility.

count of children from poverty families (less than $2,000) became decreasingly representative of the true poverty population, while the number of AFDC children eligible for title I increased significantly over the years.

The AFDC increase was attributable in part to the growth throughout the country of the concept of aid to such families and in part to the fact that, in the various States, changing welfare payment schedules increased the fraction of these families whose annual benefits were $2,000 or more. One factor which should be kept in mind is that States are free to set their own welfare standards; those that set relatively high levels would automatically increase their count to title I eligibles. Another problem is that the children whose parents worked, but at relatively low wages—say, $3,000—would not be counted at all.

The growth in AFDC numbers was inequitable—not primarily because this component was updated while the other component was not; rather, the fault was in the method of updating, with its differential impact on the incidence of the eligible populations in different geographic areas. That is to say that if AFDC had been a pretty good surrogate of children from homes in which the family income is less than $2,000, updating one without updating the other would not create inequities; but in that event there would not have been any need for the two separate components. In fact, however, the two occur in different places with different intensities, as we will show below. Moreover, if the formula had been properly implemented, the count of low-income children would have been adjusted to exclude those counted as eligible under AFDC; this exclusion was not made. The effect of this failure could have been reduced if the eligibility level for AFDC families had been increased. This adjustment was not made either, and the result was a double-counting that further intensified whatever maldistributions occurred solely from the growth in the AFDC count.

The release of 1970 census income data—far from improving the accuracy of the allocation, as would ordinarily be expected—actually worsened it because of the way the data were applied. The 1970 data were used without adjusting the income standard to reflect the higher living costs prevailing in 1970 compared with those in 1960.[6] The dollar incomes of many poor families did indeed rise during the 1960's, but not commensurably with the increased costs of living. Thus, with the standard of poverty fixed at $2,000, families that everyone would have agreed were poor in 1970 were not counted as poor because the 1960 yardstick was still being applied.

One further drawback of the 1965 formula was that it used a single flat figure for poverty—$2,000. Obviously, at today's prices $2,000 is inadequate, and it may well have been inadequate in 1965 when the act was passed. Aside from that fact, however, the use of a flat figure for all situations ignores the influence of and differences among such factors as family size, age of family members, differences in cost of living from city to rural areas and from region to region. The payment rate provision, discussed below, is an attempt to deal with the last of these flaws, but the others are significant ones for which no adjustments were made.

These difficulties and the anomalies that they led to did not escape notice. By 1972, when the Congress began debate on how the title I formula should be revised, major changes had taken place, as can be seen in table 1. For 1965 and 1972, we show, for each State, the counts of poverty children, AFDC children, the total of the two, and the percentage title I eligible children are of the total national population.

In 1965, the AFDC portion of the formula contributed about 583,000 eligible children, or 10 percent of the total children counted as eligible for title I. By 1972, the updated AFDC counts had increased the number from this component to 2.9 million, or more than half of the total. In contrast, the poverty children—those from families of income less than $2,000—fell from almost 5 million to 2.6 million between the 1960 and 1970 censuses.

These changes did not occur uniformly throughout the Nation, and this has an important impact, in terms of funds received, on how the States fare under the allocation procedure. Although Congress generally intends to allocate a sufficient amount of funding to reach every eligible child, the appropriations from title I are never sufficient to fully fund the program. In that case, each State's funding is based on the proportion that its number of eligibles bears to the total number of eligibles. These important percentages are presented in columns 2 and 6 of table 1, for 1965 and 1972 respectively. The real impact of the changes over this time can be seen by reviewing the figures for certain States.

The Northern urban States, which generally set quite high welfare payment levels, contain most of the AFDC-eligible children, and thus these States uniformly made the principal gains in eligibility. California, New Jersey, and New York more than doubled their percentage of the national total. The greatest relative losses in eligible population were concentrated in those States with low AFDC standards, and this occurs particularly in the poor Southern States. (Note that Georgia, where this meeting is being held, had no AFDC eligibles in either year.) Many States suffered more than a 50-percent diminution in their share of total eligibles.

We noted above that a State's title I allocation depends not only on the number of economically disadvantaged and the proportion that that number bears to the Nation's total, but also on its so-called payment rate. Although this part of the overall allocation process is not germane to the discussion of the formula, it is another instance of the interdependence between data availability and policy decisions; it also illustrates another area in which there is a gap between the need for data and the availability of data.

To attempt to make the payments to each State more equitable, it is desirable to adjust payments to recognize the differences among the States in their cost of education in relation to average national costs. That is, a given title I allocation per pupil will buy less supplementary services in a State that has high educational costs than in one in which costs for equivalent services are low, and the payments should be adjusted to reflect this fact. The 1965 act incorporated an adjustment that could be regarded as a crude attempt to recognize this need and to adjust for it. It established the payment rate that a State would receive at one-half the State's average per-pupil expenditure or at one-half the national average per-pupil expenditure—whichever is greater for each State. Because per-pupil expenditure data are available within several years after the money is spent, it is not difficult to update the payment rate.

[6] A generally accepted measure of the cost of living is the Consumer Price Index. Between 1960 and 1970 the CPI increased by 31 percent. Sources: U.S. Bureau of Labor Statistics, as quoted in Statistical Abstract of the United States: 1974, p. 404.

Table 1. Number of Low-Income Children Under Original Grant Eligibility Standard: 1965-1972

(Children in thousands)

State	1965				1972			
	Total	Percent of national total	Under $2,000 (1960 census)	AFDC, over $2,000 (1962)	Total	Percent of national total	Under $2,000 (1970 census)	AFDC, over $2,000 (1971)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total	5,530.7	100.0	4,948.1	582.6	5,567.4	100.0	2,645.8	2,921.6
Alabama	242.5	4.4	242.5	-	97.1	1.7	96.0	1.1
Alaska	5.7	0.1	4.8	0.9	8.7	0.2	4.3	4.4
Arizona	44.5	0.8	38.9	5.6	47.0	0.8	29.3	17.7
Arkansas	148.2	2.7	148.2	-	52.2	0.9	52.2	-
California	308.7	5.6	206.6	102.1	780.8	14.0	214.4	566.4
Colorado	40.9	0.7	33.6	7.3	57.9	1.0	25.4	32.5
Connecticut	28.3	0.5	20.7	7.6	64.5	1.2	22.2	42.3
Delaware	7.4	0.1	7.4	-	10.8	0.2	5.6	5.2
District of Columbia	20.8	0.4	14.9	59.0	43.7	0.8	13.3	30.6
Florida	142.5	2.6	142.5	-	120.0	2.2	100.7	19.3
Georgia	239.8	4.3	239.8	-	93.1	1.7	93.1	-
Hawaii	11.2	0.2	8.8	2.4	18.6	0.3	7.2	11.4
Idaho	14.7	0.3	12.3	2.4	13.0	0.2	7.4	5.6
Illinois	230.0	4.2	147.5	82.5	315.1	5.7	103.8	211.3
Indiana	79.9	1.4	76.4	3.5	73.6	1.3	41.8	31.8
Iowa	81.1	1.5	71.8	9.3	49.8	0.9	22.5	27.3
Kansas	45.7	0.8	40.3	5.4	50.0	0.9	22.1	27.9
Kentucky	193.6	3.5	193.6	-	98.3	1.8	68.8	29.5
Louisiana	201.3	3.6	201.1	0.2	126.6	2.3	114.6	12.0
Maine	21.1	0.4	18.4	2.7	27.4	0.5	10.1	17.3
Maryland	63.1	1.1	53.7	9.4	97.0	1.7	43.1	53.9
Massachusetts	63.9	1.2	47.1	16.8	146.5	2.6	41.7	104.8
Michigan	145.7	2.6	124.7	21.0	232.5	4.2	83.7	148.8
Minnesota	89.0	1.6	77.3	11.7	71.5	1.3	31.9	39.6
Mississippi	254.9	4.6	254.9	-	98.7	1.8	98.7	-
Missouri	136.5	2.5	125.2	11.3	94.6	1.7	59.2	35.4
Montana	15.6	0.3	14.1	1.5	13.8	0.2	8.2	5.6
Nebraska	35.1	0.6	34.4	0.7	30.3	0.5	15.8	14.5
Nevada	3.9	0.1	3.2	0.7	6.4	0.1	4.0	2.4
New Hampshire	7.0	0.1	5.9	1.1	9.9	0.2	4.5	5.4
New Jersey	85.3	1.5	59.8	25.5	223.6	4.0	57.7	165.9
New Mexico	41.9	0.8	37.6	4.3	43.1	0.8	27.9	15.2
New York	300.0	5.4	200.1	99.9	747.9	13.4	194.6	553.3
North Carolina	326.6	5.9	323.1	3.5	123.6	2.2	99.2	24.4
North Dakota	25.1	0.5	23.3	1.8	12.9	0.2	8.1	4.8
Ohio	177.4	3.2	151.9	25.5	217.5	3.9	104.1	113.4
Oklahoma	95.9	1.7	84.8	11.2	32.5	0.6	37.3	28.8
Oregon	30.2	0.5	23.9	6.3	47.3	0.8	19.6	27.7
Pennsylvania	235.7	4.3	175.4	60.3	325.2	5.8	102.0	223.2
Rhode Island	16.1	0.3	12.1	4.0	25.8	0.5	8.8	17.0
South Carolina	206.6	3.7	206.6	-	75.8	1.4	71.8	4.0
South Dakota	32.2	0.6	30.7	1.5	17.9	0.3	10.8	7.1
Tennessee	220.0	4.0	220.0	-	81.8	1.5	81.8	-
Texas	398.2	7.2	398.2	-	257.9	4.6	192.6	65.3
Utah	13.8	0.2	11.7	2.1	21.2	0.4	9.6	11.6
Vermont	7.8	0.1	7.2	5.8	9.3	0.2	3.5	5.8
Virginia	171.0	3.1	167.9	3.1	110.8	2.0	67.8	43.0
Washington	42.9	0.8	33.1	9.9	66.8	1.2	29.7	37.1
West Virginia	106.5	1.9	106.4	0.1	50.2	0.9	35.5	14.7
Wisconsin	68.9	1.2	58.4	10.4	70.0	1.3	34.6	35.4
Wyoming	6.1	0.1	5.4	0.7	5.1	0.1	3.3	1.8

- Represents zero.
Source: Unpublished data from National Center for Educational Statistics.

Table 2. **Title I Payment Rates: 1972**

State	Percent of national average	State	Percent of national average
Total	100.0	Montana	90.6
		Nebraska	92.8
Alabama	63.3	Nevada	95.6
Alaska	171.8	New Hampshire	86.5
Arizona	87.9	New Jersey	128.3
Arkansas	60.6		
California	99.6	New Mexico	82.0
		New York	166.2
Colorado	94.8	North Carolina	70.9
Connecticut	121.5	North Dakota	81.1
Delaware	118.8	Ohio	88.3
Florida	90.7		
Georgia	67.8	Oklahoma	73.0
		Oregon	111.4
Hawaii	108.2	Pennsylvania	110.6
Idaho	72.0	Rhode Island	111.2
Illinois	111.4	South Carolina	68.6
Indiana	91.5		
Iowa	101.7	South Dakota	79.6
		Tennessee	65.2
Kansas	88.9	Texas	78.7
Kentucky	64.5	Utah	77.0
Louisiana	87.4	Vermont	99.1
Maine	84.5		
Maryland	115.6	Virginia	87.6
		Washington	101.7
Massachusetts	101.4	West Virginia	78.6
Michigan	113.7	Wisconsin	110.8
Minnesota	116.4	Wyoming	107.4
Mississippi	57.4	District of Columbia	128.6
Missouri	85.6		

Source: Data from Elementary and Secondary Surveys Branch for Use In Title I, ESEA.

The index of per-pupil payment rates actually used to distribute title I funds in fiscal year 1972 is shown in table 2. The degree to which this adjustment is considered equitable is open to question, particularly with regard to the high-spending and the low-spending States. The 32 States with per-pupil expenditures below the national average were all brought up to average expenditures in computing their payment rates. While these are generally lower income States and may have lower expenditures for this reason, many of them are also States in which teacher salaries and prices generally are below national average rates. To bring all these States up to the national average is in conflict with the fact that, in at least some of these States, title I dollars have greater than average purchasing power. At the other extreme, there are no limits on the maximum payment rate, and this too can cause inequities. High State expenditures are rewarded by higher title I payments. Although high expenditures may be caused in part by the higher costs of purchasing educational resources, they may also result from the fact that States in the upper spending range simply have greater resources and choose to spend them on education. To the extent that this is the case, the limited funds from a national program should not be directed heavily to the States that least need them.

REFORM AND ITS OUTCOME

These considerations made it apparent that it was necessary to modernize the title I formula. It was also apparent that the considerations of the structure of the formula could not be separated from considerations of data availability. It is significant that these considerations became an integral part of the policymaking process of both Congress and the Administration.

Political considerations were naturally of great importance to members of Congress as they viewed the impact of various formulas on the funding that would come to their jurisdictions. In the final analysis, however, political considerations were not paramount—equal priority was given to assuring that the formula would target on the disadvantaged, as it was intended to do, and that it would not suffer the aging process that had befallen the 1965 formulation.

The updating issue was of particular interest. The 1965 formula had shown the significance of the errors that could arise over time. Another difficulty, however, lay in the fact that, since each jurisdiction was more or less used to its allocation, substantial political problems might be created by righting in one stroke the wrongs that had built up over a decade. The gains

and losses in funding under a reformed allocation could be very large, and this assured a heated debate. In fact, 2-1/2 years passed before a consensus was reached on a new formula. Congress did not wish a repetition of the conflict as time passed on.

Of the many proposals offered, the following three options are representative of major approaches. Our interest is directed toward the specification of the low-income criteria for eligibility, but plans also specify a payment rate which is briefly discussed below. The central characteristics of these plans are summarized in table 3. Also discussed are Congressionally-mandated studies on title I data that emerged in conjunction with the formula decision.

The three proposals under review for formula reform represent the positions of: (1)The Administration; (2) Congressman Quie, Ranking Minority Member of the House Subcommittee on Education; and (3) Congressman O'Hara, Democrat of Michigan.[7] These plans are first reviewed with respect to their eligibility criteria, and then, briefly, with respect to their proposed payment rates.

The cornerstone of the Administration's plan (table 3, column 2) was the adoption, as its criterion of low income, of the poverty index revised and approved by a Federal interagency committee in 1969 and hereafter referred to as the Federal poverty index. This index was originally developed at the Social Security Administration by Mollie Orshansky.[8] The measure had been widely used in statistical studies as the yardstick of poverty; but its application in the administration of the largest Federal program of aid to education represented a novel use that was subject to careful Congressional scrutiny.

While notions of poverty cannot be wholly divorced from prevailing societal values, the Federal poverty index offers a reasonably objective basis for defining those who are poor. The poverty index is pegged around the U.S. Department of Agriculture's food plans which specify the cost to different types of families of the amounts and kinds of food that would yield them a diet adequate for emergency purposes. In all, separate poverty thresholds are calculated for 124 different family types, distinguished by sex of head of household, the number of children under 18, the number of other persons present in the home, and whether their household residence is farm or nonfarm.

Most important, the Federal poverty index provides for an annual update to reflect changes in family living costs. Prior to 1968, the poverty thresholds were adjusted each year by changes in food costs published annually by the Department of Agriculture. Changes in food prices in recent years have failed, however, to be a good indicator of the total rise in living costs as reflected by the Consumer Price Index (CPI). Therefore, the CPI is now employed to annually adjust the poverty levels.

The Federal poverty index was not, in all respects, a satisfactory measure of the low-income population. A point of major concern to Congress was its failure to adjust explicitly for geographic differences in living costs, other than those for farm/nonfarm differences.[9] In particular, representatives of center city districts argued that their higher living costs went unrecognized. This problem is not easily correctable as the Consumer Price Index is available only for selected metropolitan areas and cannot be adopted as a national cost adjustment.

The Quie proposal (table 3, column 3) was built upon the basic structure of the 1965 act. It retained the double criteria of a single (although higher) threshold for low-income families and the additional eligibility of children from families with annual AFDC payments over the threshold, but altered their form to reflect the experience of the 1960's. Accordingly, low income was adjusted upward to $3,000 and only two-thirds of the children in AFDC families with payments over $3,000 were counted for purposes of funding. The rationale of the $3,000 cutoff was that it roughly equaled the 1960 threshold of $2,000 adjusted upward for the rise in living costs during the sixties. A $3,000 standard, which was still below the average for the Federal poverty index ($3,750 for a family of four), suggested that the original $2,000 standard was inadequate to begin with. Moreover, any fixed level suffers the same defects of aging that befell the $2,000 standard.

The matter of weighting the AFDC component comprised a major issue between pro- and anti-AFDC factions. Critics argued that AFDC was a variable yardstick of poverty that favored high income States that could afford higher welfare payment levels. Proponents of AFDC countered that the AFDC add-on was a necessary adjustment, however crude, for high living costs, particularly in heavily urbanized States.

The O'Hara proposal (table 3, column 4) opted for a more radical approach to reform than the first two. O'Hara would simply count, for purposes of payment, all school-aged children (ages 5 to 17) in each State. An advantage of this approach is that the formula can be updated from annually revised U.S. Bureau of the Census estimates of State populations. This formula posed a serious conflict among policy priorities. The gain in currency of information under O'Hara had to be traded off against the possible loss of a well-defined target population—children from low-income families.

The three plans also differed in their proposed rate of title I payments per eligible child. The Administration and the Quie proposals were again similar to existing law, with certain modifications. The Administration program lowered the minimum State rate to two-thirds of the national average per-pupil expenditures. The Quie program retained the minimum at the national average but introduced a maximum rate of 120 percent of national average spending. The O'Hara formula suggested that the payment rate serve as a device for recognizing lower income areas. Each State's payment rate was adjusted by the inverse of the ratio of that State's income per child to the national average. The distribution of funds within States was not, however, limited to low-income populations.

The proposals just discussed were differentially advantageous depending on what efforts would simultaneously be made to improve data availability. The O'Hara proposal, with its shift to total school-age population, would be easiest to adopt since it did not require updating the low-income standard between census years. The Quie proposal to include AFDC at reduced weight represented a good compromise if more direct measures of interarea differences in living costs were not developed. The Federal poverty index, with an objectively determined standard

[7] Congressman Perkins, Chairman of the Subcommittee on Elementary, Secondary, and Vocational Education of the Committee on Education and Labor also submitted a major proposal. It is not reviewed in detail here, because most of its components are contained in the three proposals discussed.

[8] For detailed discussion of the SSA poverty standards, see "Revision in Poverty Statistics, 1959 to 1968," Current Population Report, Series, P-23, No. 28, August 12, 1969 and Mollie Orshansky, "Who's Who Among the Poor. A Demographic View of Poverty," Social Security Bulletin, July 1965.

[9] The poverty income level for a farm family is computed as 85 percent of the level of the nonfarm family with equivalent characteristics.

Table 3. **Comparison of Distribution Formulas for Disadvantaged of Educational Funds**

Item	Title I Law (1965)	1972 alternatives			P.L. 93-380
		Administration	Quie	O'Hara	
	(1)	(2)	(3)	(4)	
Eligible population[1]	Children from families with income less than $2,000, plus children in AFDC families with income over $2,000.	Children from families defined poor under the Federal poverty index	Children from families with income less than $3,000 plus 2/3 of children in AFDC families with income over $3,000.	All children of school age (5 to 17)	Children from families defined poor under the Federal poverty index plus 2/3 of children in AFDC families with income above current year Federal poverty index for a family of four
Payment rate per child[2]	50 percent x maximum of State or national average per pupil expenditures	35 percent x maximum of (State average expenditure per child or 2/3 national average expenditure per child)	40 percent x maximum of State average expenditure per child or National average expenditure per child, except that the payment rate cannot exceed 120 percent of national average	100 percent (50 percent of the ratio of State average income per child divided by the National income per child), except that percent cannot be less than 33-1/3 percent or greater than 66-2/3 percent.	40 percent of State average expenditures, except that the rate cannot be less than 80 percent or more than 120 percent of national average

[1] In each case, the eligible population also includes children in State institutions for the delinquent, etc.
[2] The payment rate per child is the amount per child which a State would receive if the bill were fully funded. The exception is the O'Hara formula, which weights the eligible population in each State by the payment rate, and distributes the total appropriation across States on the basis of each State's share of the national total weighted population.

of need, annually revised, appeared particularly advantageous if low-income data were also revised between census years.

Congress, as it turned out, saw fit to pass a comprehensive set of title I legislative amendments, addressing both formula and data needs simultaneously.[10] The formula revisions compromised between the Administration and Quie proposals (table 3, column 5) rejecting the radical O'Hara formula, as follows: (1) Eligibility to rest on children from families defined as poor, utilizing the 1970 census poverty criteria (based on Federal poverty index of 1969), and two-thirds of the children in AFDC families with incomes above poverty level (the Quie formula), and (2) a payment rate of State average spending per pupil with both upper and lower limits (80 percent and 120 percent of national average spending).

The Congressionally mandated studies will fill some data gaps and determine the feasibility of filling others. These studies cover:

a) Section 822a specifically requires the Secretaries of Commerce and of the Department of Health, Education, and Welfare to furnish current data on the title I low-income population on a State representative basis. In conjunction with the annually revised Federal poverty index, these numbers enable the update by State of title I allocations prior to the 1980 census.

b) Section 822b mandates a study of the feasibility of updating the number of title I eligible children across school districts within States.

c) Section 823 is a study of the adequacy of the Federal poverty index as a measure of poverty to include the availability of more current data, cost of housing data, income distribution data, and labor market, wage rate, and unemployment rate data.

[10] These provisions are contained in the Education Amendments of 1974, P.L. 93-380.

ADDITIONAL EDUCATIONAL REQUIREMENTS

The title I formula of the Elementary and Secondary Education Act (ESEA) is the most publicized example of a Federal educational program in need of State and local low-income data, but it is by no means the only important example. Many other Federal educational programs have equal educational opportunity as an objective, and consequently, also target on the low-income child. The data needs of such programs should be considered along with title I requirements, not only to prevent duplication but also to help in determining the relative priority of data needs in relation to policy.

The specification of data requirements is more complicated than generally recognized. Item content, geographic detail, frequency of collection, and accuracy of data all form part of the determination of requirements. The debate on the title I formula is a good example of issues relating to the frequency and accuracy of updating the low-income-child counts at the local level.

Another need, of a different sort, for low-income data emerges from the current debate on school finance. A number of State courts have found that existing spending disparities across school districts, attributable to local wealth-based taxation, are unconstitutional, and pressures for Federal involvement are building. But the equalization of educational opportunity across school districts must consider educational outcomes, as well as educational spending levels, in determining inequities in educational opportunity. Low family income is needed in the development of a Federal equalization strategy. Although property valuation has been the measure of ability to finance education traditionally used in examining disparities, family income may be a better measure since taxes are ultimately paid out of income. In this case, a district's average income, either per pupil or per capita, is the preferred statistic.

Combined with other socioeconomic or demographic series, income data can address other issues of educational policy. For instance, many Federal programs attempt to reach children with special educational needs other than those caused by economic deprivation. Examples include bilingual or handicapped education programs. It is essential to know how these groups overlap with the low-income child to estimate the total target population and the Federal costs to serve this population. Another example comes from the Federal government's desegregation activities. We know a great deal about the effects of desegregation on removing racial isolation in schools, but know very little about its effects on the segregation of children across family-income classes. Economic desegregation may be as basic to educational objectives as racial integration. Still a third example would be data on the relationship of income to educational attainment as an important indicator of the actual extent to which the goal of equal educational opportunity is achieved.

Education is unique in requiring geographic detail at the school district level—and even at the school attendance level. These are the natural administrative units in the system of delivering education, and the use of data in larger divisions, such as counties, introduces errors that cannot be countenanced in the operation of many programs. On the other hand, the normal unit for U.S. Bureau of the Census tabulations is the general-purpose government. Census tabulations are frequently of limited use in educational analysis or policymaking simply because the school districts are not conterminous with the general-purpose governments. The U.S. Office of Education has recently attempted to bridge that gap by recoding 1970 census data by school district.[11]

Census data routinely provided by school district could serve a number of needs. They could improve allocations in a number of Federal formulas that use economic need as an allocative factor. These formulas, including title I, have been limited to the county as the lowest unit of distribution. We noted in an earlier section that in this circumstance the State determines the subcounty allocations to school districts. But audit reports have found that these State determinations are often inequitable. The school finance controversy also requires district-level data for its analysis. Again, in the desegregation area, whether or not high-income families have flown from school systems in which desegregation is taking place cannot be answered without data at the district level.

As we pointed out earlier, educational needs also extend below the district to the school attendance area. Many districts have already developed estimating procedures on their own to locate school attendance areas of high poverty concentrations. The need to distribute title I funds below the district level was a major force in this development, but the same information could serve other uses. There is a need to know whether school districts discriminate against schools serving low-income neighborhoods in the allocation of their school services. The extent of socioeconomic integration between schools is another use. However, with the busing of children between neighborhoods, census data must be adjusted to determine actual student composition by schools.

Added geographic detail should not come at the expense of accuracy of information. The sample size diminishes with the size of geographic area, thereby raising the error of estimate. The school district mapping study was forced to exclude certain school districts (those with less than 300 pupils) because of large sampling errors. With respect to the income issue, income questions are asked of only 20 percent of households; complete enumeration of all households would improve accuracy, but would have to be weighed against competing uses for this interviewing time. Another consideration is that population mobility also increases as the size of the geographic area diminishes which reduces the value of census data over time.

The importance of updating income data between census years has already been shown by the title I example. How frequently data should be updated will depend on how rapidly error increases. This will also depend on other requirements such as the size of the geographic area. Updating across States is expensive, but how expensive depends on the degree of accuracy desired. The trade offs between costs and accuracy are considerable. This will be described with respect to the update of the title I poverty counts at the State level by other papers in this session.

SUMMARY REMARKS

From what we have seen in this brief review, it is clear that the Federal education programs are important requesters of data on low-income populations. Choices must obviously be made among competing demands for data, and in making these choices it is necessary to set up a process by which the requirements for data can be defined and evaluated. A primary difficulty is to assure that the data requirements are directly correlated with program objectives, current and future. Program objectives are most often stated in such highly general terms that it is necessary to "operationalize" them—that is, to establish the practical link between the abstractly stated objectives and the interview or questionnaire form.

It is commonplace that there should be strong interaction between the policy people who will use the information and the statistical agencies who generate the data. It is also commonplace, however, that this idealized interaction so seldom occurs that it is regarded as impossible in practice. Each group—the policymakers and the data collectors—has quite separate priorities. The policy people are dissatisfied with the quality and usefulness of information, and the data agencies are frustrated with the inability of policymakers to specify their real needs in sufficient detail to serve as a basis for action.

When an example comes along, therefore, in which a joint process of consideration of policy and data issues simultaneously takes place, then it seems worthwhile to examine the occurrence in some detail. We trust that the title I program described here provides one such example.

[11] "1970 Census Fourth Count—1970 Elementary and Secondary General Information Survey," prepared under the direction of William Dorfman, U.S. Office of Education.

Collection and Use of State and Local Socioeconomic Data: Two New Federal Efforts

Wray Smith
Department of Health, Education, and Welfare

INTRODUCTION

The purpose of this paper is to report on two quite different Federal efforts that I think will be of interest to this conference because each is strongly related to the way in which small-area data will be available and used in the future. The first is the development of a Federal mechanism for providing consultation and assistance in the use, by States and local governments, of statistical resources available in Federal agencies. The second is a large-scale survey to count school-age children in poverty families, and thus provide data at a halfway point between the regular decennial censuses.

INTERGOVERNMENTAL COOPERATION AND STATISTICAL RESOURCES

As most of you know, in addition to the central Federal bureaucracy in Washington, there are 10 Federal regions, each of which is a small mirror image of Washington in that it contains representatives of each of the domestic agencies. In their regions, the representatives deal directly with State and local government officials on problems that arise in implementing Federal laws and regulations. In 1972, this regional organization was augmented by the formation of Federal regional councils (FRC's). In each region, an FRC is composed of senior policy officials from that region's various domestic agencies: The Departments of Health, Education, and Welfare; of Labor; of Housing and Urban Development; and of seven others.

The FRC's were formed to improve the service that the Federal Government provided to State and local governments in coordinating direct Federal program assistance; in providing information and technical assistance on Federal programs; and in developing innovative means to better respond to the needs of State and local governments. Naturally, the FRC's are concerned principally with programs or problems that cut across two or more of the individual departments.

In the past 2 years, four of the councils, supported by the Bureau of the Census, undertook several pilot activities designated as socioeconomic-demographic systems (SEDS's). These exploratory SEDS projects were initiated in the regions whose headquarters are in Boston, Kansas City, San Francisco, and Seattle. A similar project was undertaken in Denver. All were directed toward stimulating better use by Federal, State, and local officials of statistical data and analytical techniques. The active regional efforts included a county-level study of the geographic assignment of probationers to probation officers; a comprehensive State-level social indicators project; and an inventory of data sources and capabilities in one region at Federal, regional, State, sub-State, local, and university levels.

In early 1975 a multiagency team was formed in Washington to assess the pilot projects. The team formulated a series of probing questions which were given to each FRC that had sponsored pilot projects. Although any self-assessment effort such as this is bound to be limited, and there are many difficulties in characterizing the benefits that can properly be attributed to the availability of more (or better) socioeconomic and demographic data, the assessment team was nonetheless able to agree on a set of quite definite findings.

In particular, the study found that there was a demonstrated need for improved use by the FRC's of statistical data and analytical techniques. It also found that greater emphasis should be placed on helping State and local governments to increase their access to such data. At the same time, there were significant needs to train managers and analysts at all levels of government in the use of statistical resources. In addition, the study recognized the need to involve in the FRC efforts those Federal agencies that play the major roles in statistical and data collection work.

After a review of the assessment study and its implications, it was decided that the FRC efforts to improve intergovernmental use of statistical resources should be continued as a regular operational activity and not merely as a short-term pilot activity. The decision whether or not to engage in such activity was left to each FRC. Although each of the five regions that initiated a pilot program will probably continue developing their statistical analysis capability, we do not yet know whether other FRC's will pursue the course.

It is not really surprising to find that there is a considerable amount of staff expertise already available in the various agencies throughout the 10 regions. In addition to the many knowledgeable people in HEW, HUD, etc., the Bureau of the Census is in the process of expanding its own regional operations. One unique role possible for FRC's is to provide, when needed, a starting point for tapping such expertise.

Thus, the role of a Federal regional council is one that could be described as that of a "broker." The FRC's, although not staffed to do substantial data work themselves, are in an excellent position to bring together, on problems of regional concern, two groups that should talk more to one another: The large group of Federal agency statistical experts from both regions and headquarters; and the decisionmakers and statistical staff in the States and communities. The FRC efforts can range from sponsorship of a specific study to the shove that is sometimes needed to obtain access to the right files and people in Washington.

The next section describes an important example of a major new State-by-State survey—a data collection effort with potentially substantial benefits for analysts in FRC's, States, and localities.

COLLECTION OF INTERCENSAL STATE-LEVEL SURVEY DATA

Survey of Income and Education: Spring 1976

In August of 1974 Congress enacted, as part of the Education Amendments of 1974 (Public Law 93-380), a provision designated as Section 822(a) which states in part that "The

Secretary of Commerce shall, in consultation with the Secretary of Health, Education, and Welfare, expand the current population survey (or make such other survey) in order to furnish current data for each State with respect to the total number of school-age children in each State to be counted for purposes of . . . Title I of the Elementary and Secondary [Education] Act of 1965." The Bureau of the Census will be carrying out this legislative mandate by augmenting the regular March 1976 Current Population Survey (CPS) sample of some 69,000 households, with a supplemental general population sample of approximately 190,000 additional households to be interviewed shortly after the regular March interviewing is completed. The combined sample of more than a quarter of a million households will provide the required State-by-State estimates of the number of children in the age bracket from 5 to 17 who are living in poverty as defined by the current Federal poverty index.

All households in the combined sample will be asked to respond to the standard March CPS questions on current labor force participation, work experience, and last year's employment and income, as well as the usual 'control card' demographic data on the household members. In addition, the supplemental 190,000 households will be asked to reply to a series of special items of interest to Congress and to program planners and administrators at all levels of government. One part of the special supplement will be directed toward an appraisal of the number of persons with a non-English-language background who may be in need of bilingual educational resources. A second part of the supplement will contain an interrelated series of detailed items on school enrollment, food stamp and public assistance recipiency, housing tenure and outlays, liquid asset holdings, child and adult disability, and public and private health benefit coverage.

The combined sample of more than 250,000 households will yield child poverty estimates for each State with estimated coefficients of variation of 10 percent or less. The supplemental sample of approximately 190,000 households will provide usable State-by-State estimates of persons with non-English language background. It will also provide a series of independent State-level microdata samples, ranging in size from about 2,000 to 5,000 households, with responses to an extensive set of CPS and non-CPS items. For many social and economic analyses, the resulting State samples will be quite respectable in size and, in fact, will be in the same sample-size range often encountered in special-purpose national social surveys. It should also be noted that, for analyses that will make use only of the standard March questionnaire items, the full combined CPS and supplement sample for each State may be used and these combined samples will have an average size of approximately 5,000 households per State.

Analytic Potential of the SIE 1976 Data

The upcoming Survey of Income and Education (SIE) under section 822(a) will become, for income security analysis, the major intercensal microdata base until data from the 1980 census become available. For most poverty related studies it will be a worthy successor to the now obsolescent Survey of Economic Opportunity (SEO). Although the SIE sample size for each State will not support detailed analyses of relatively rare population subgroups, such analyses may be carried out on the SIE data at the national level and for multi-State regional groupings.

For policy studies at the Federal level heretofore limited to exploitation of the regular March CPS and to various configurations of the 1970 Census Public Use Samples (PUS), the availability of the 1976 SIE data sometime in calendar year 1977 will be a most welcome event. At HEW, where the Transfer Income Model (TRIM) has become a much-used tool for the estimation of costs and caseloads for a variety of possible revisions or replacements of existing welfare programs, the annual March CPS data sets have been utilized extensively with resort to the 1970 PUS for some purposes. The availability, even on a one-time basis, of the 1976 SIE will make possible a whole series of State-level analyses and assessments of differential State-by-State impacts of alternative program reform proposals, using TRIM and other modeling techniques, for a number of welfare topics.

Going beyond the standard March CPS items that will appear on the 1976 SIE, the proposed items on food stamp recipiency should remain relevant not only to the ongoing political interest surrounding the food stamp program, but also to any attempts to place an income-equivalent value on food stamps as part of a revised poverty definition. Similar considerations are applicable to the proposed items on housing tenure and outlays, and the SIE supplement data should be useful to some degree for analyses dealing with the valuation of the appropriate income equivalence for owner-occupied homes. Asset holdings have proved to be a useful data area in analyses of the SEO, and the proposed liquid assets item on the SIE should also be of considerable utility.

It has not been our purpose here to attempt to give a complete preview of the proposed SIE supplement in relation to the standard March CPS questions, but rather to give a general characterization of the upcoming SIE as a significant addition to our portfolio of microdata sets and one of the very few that will support useful State-level analyses.

OPPORTUNITIES FOR MULTILEVEL DATA UTILIZATION PROJECTS

It is not too soon to begin conceptualizing a wide range of national, regional, and State-level analyses of the forthcoming SIE data base. State and local inputs concerning the most useful subnational tabulations that should be published from the SIE data will be more useful if they are received within the next few months. But a potentially more important area of consultation between Federal representatives and State and local officials and academic institutions is to be found in the realm of joint planning for special analyses of the SIE microdata base on matters of regional or local concern.

As I indicated earlier, the Federal regional councils can serve as a central focus for communication and consultation concerning the statistical resources that might be brought to bear on the analysis of newly available State-level data such as the forthcoming SIE. The FRC's in turn may consult with the major Federal statistical agencies and Washington policy analysts concerning the feasibility of various specific in-depth analysis projects that would involve joint Federal and non-Federal cooperation. The FRC's, as a rule, should be open and responsive to the possibilities of such undertakings.

With the advent of the forthcoming SIE data base, taken together with the annual March CPS and, shortly, two rounds of

the Annual Housing Survey (AHS), analysts concerned with issues at the level of multi-State regions, States, and major standard metropolitan statistical areas (SMSA's) will face a challenging array of possibilities for the joint use of these micro-data sets in conjunction with existing census data and updated projections for larger and smaller areas. It may safely be predicted that the full utility of these data sets will only be realized after many detailed and persistent attempts—no doubt accompanied by failures along the way - to wring from them the illumination they can provide to small-area analytic problems.

It appears reasonable to suggest that a full familiarity with these data sets will lead to more informed proposals for special data collection efforts for small areas. In many cases the data sources outlined above may provide reasonably current control totals and useful prior estimates for parameters of interest in local analysis efforts. Again, there is room for a cooperative approach by Federal and non-Federal statisticians to the development of new methodology and the design of special data collection projects. The continued scarcity of financial resources only serves to emphasize the need for such an approach.

Methodology for Estimating the Number of Children in Poverty for States and Counties

Herman P. Miller, Consultant
Abdul Khan, Senior Policy Analyst
Department of Health, Education, and Welfare

Congress has mandated that a study be made of the feasibility of updating estimates of the number of children in poverty for States and substate jurisdictions. These estimates are needed for the distribution of funds under Title I of the Elementary and Secondary Education Act. Various formulas have been used to distribute these funds in the past. In 1975, the distribution of funds to counties will be made on the basis of a complicated formula which includes, among other factors, the eligible population comprising the following: (1) The number of children in families with incomes below the poverty level as determined by the Census Bureau in 1970; (2) two-thirds of the number of children in families above the poverty level with Aid to Families With Dependent Children (AFDC) payments in 1974; and (3) the number of migrant and delinquent children. The current use of Census Bureau estimates of the number of children in poverty, which are now 5 years out of date undoubtedly distorts the proper allocation of funds under this law. The purpose of the research which has been undertaken is to determine the feasibility of developing alternative methods of preparing current estimates of the number of children in poverty for States and counties.

Three basically different estimating procedures are being tested. The *first* method is based on Current Population Survey (CPS) and 1970 census data and on various types of currently available administrative record data, integrated by means of regression techniques. The *second* method attempts to estimate the number of children in poverty from tax returns and is based primarily on a matching of census and IRS records for the purpose of identifying those tax returns showing children in families below the poverty level. Both of these techniques are being developed by the staff of the Census Bureau under contract with the Department of Health, Education, and Welfare (HEW). The *third* method is based on a matrix of families classified by size of family and income level for each State based on the 1970 census, updated by current estimates of income distribution for each State and county prepared by the Bureau of Economic Analysis (BEA) of the Department of Commerce. This work is being done by the Regional Economic Analysis Division of BEA working under contract with HEW.

The results described in this paper are based in large measure on tabulations and analyses prepared by the staff of the Bureau of the Census and the Regional Economic Analysis Division.

REGRESSION ESTIMATES BASED ON CENSUS DATA

Current Population Survey Estimates by State, 1967-73

The Current Population Survey (CPS) is a scientifically designed sample survey of the United States population. The present CPS sample was selected to produce accurate estimates of demographic characteristics, especially employment and unemployment, at the national level. The national estimates are typically subject to relatively small sampling errors. State estimates can also be tabulated from the CPS sample, but the sample was not designed to do this efficiently. The sampling error is quite large for most States and it also varies greatly from State to State.

One way to evaluate the CPS State estimates is to compare them with the results of a decennial census. Although the 1970 census estimates are also based on a sample, the level of sampling error for these figures is considerably lower than for the CPS. For all practical purposes, the census figures may be treated as if they were free from sampling error at the State level.

There are striking differences between the March 1970 CPS and the 1970 census estimates. The differences for the smaller States are undoubtedly due largely to sampling error. However, the differences for some of the larger States are more likely attributable to nonsampling errors. For example, the odds are only about one out of ten that the large relative difference between the CPS and census estimates for California and New York are due to sampling. These differences undoubtedly reflect factors other than sampling.

Nonsampling errors are typically manifested by underreporting, misreporting, or nonreporting of requested information. The more prominent influences on nonsampling error include (1) the willingness and ability of the respondent to cooperate, (2) the method of data collection, (3) the nature of the information requested, and (4) processing and interviewer errors. A substantial effort has been made to reduce the influence of nonsampling error in the CPS; however, this is still a problem area which remains difficult to quantify.

Several types of nonsampling error are known to exist in the CPS. Income tends to be underreported because some respondents overlook small amounts of income not regularly received, such as interest, dividends, and contributions from nonhousehold members. Errors in reporting may also occur if the respondent misunderstands the question or lacks information. The latter is likely to occur if one family member is reporting for other family members who are not present at the time of interview. Respondents are sometimes reluctant to reveal certain types of information, such as income received from illegal activities or the receipt of public assistance, because of a perceived social stigma. Enumerator errors and difficulty with the mechanical equipment during the processing of the data can also be responsible for the entry of erroneous information into the records.

Nonsampling errors occur in full-scale censuses as well as household surveys such as the CPS. Because of the different set of circumstances between the CPS and Decennial Census of Population, there is no reason to assume that the impact of nonsampling errors will be the same for both. Two of the major differences which favor the CPS results are (1) the CPS includes a more detailed set of income questions and (2) in general, the CPS interviewers are a more experienced group than the census interviewers. One difference which favors the 1970 census results is that the decennial census is required by law and it benefits from a widespread publicity campaign. Although, various studies have been made about sources of nonsampling error in both the CPS and census, there are no definitive results on the differences in bias in income reporting, and in particular about the measurement of the percent of children in poverty at the State level.

The nonsampling differences between the CPS and census data vastly complicate the problem of validating the results obtained from estimating procedures used to prepare current estimates. Results based on an updating of decennial census data can not be adequately validated by being compared with CPS results, even if the CPS is considerably expanded.

A comparison with the decennial census is only one way to validate the CPS results. A second method which has been used in this report is an examination of the consistency of the annual results for a period of years. In this respect, a special tabulation was made of the CPS data showing the proportion of children in poverty (CIP) by State, for 1967-73. These data show there are relatively few States for which the CPS can provide consistent and reasonable annual estimates of CIP. A comparison of the CPS and the census estimates for 1969 as well as the annual estimates of CIP for 1967-73 shows that the 10 largest States contain about two-fifths of all the poor children in the United States. In most of these States, the CPS estimates of CIP are consistent with the census results and the year-to-year changes seem reasonable. These results are encouraging, but, they apply to only one-fifth of all the States.

As part of this project, a study was instituted which may effectively double the size of the CPS sample for each year since 1969. Such an expansion would reduce considerably the sampling error of the CPS estimates and increase the number of States for which it may be possible to prepare reasonably reliable annual estimates of CIP. The current Census Bureau estimates of poverty are based on the annual March CPS supplement in which approximately 50,000 households are asked detailed questions about their income during the preceding calendar year. These detailed questions are asked for each member of the household. A similar set of estimates can be prepared by tabulating the income data for the 8 rotation groups in the October survey each year (also about 50,000 households). These data are based on a family income question that is asked for each household when it is interviewed for the first time and when it returns to the sample for the fifth interview after a lapse of 8 months. ("What was the total income of this family during the past 12 months? This includes wages and salaries, net income from business or farm, pensions, dividends, interest, rent, Social Security payments, and any other money income received by members of this family.") Although the control card income information is collected in broad income intervals, a procedure has been devised to replace the control card income *level* with an *exact* income for each family and to use that income as a basis for classifying the family according to poverty status. In view of the different questions used to collect the income information in the March and October surveys, the data for each sample will be tabulated separately and the results will be examined before doing any further analysis. It seems likely at this stage that it will be feasible to average the two estimates for each year for purposes of their use in regression analysis.

The basic procedure for imputing an exact income to each family in the October CPS sample involves the *statistical* matching of families in the March and October samples. Control card information for broad income intervals is collected for each family in the March and October samples. In addition, detailed income information is collected for each family in the March sample. Families in both samples will be tabulated according to a variety of characteristics including age, color, and sex of head, size of family, number of earners and broad income level. Within each of these categories, the broad income level reported in the October survey will be replaced with the exact income from the March survey. This procedure is known as statistical matching. The exact incomes will then be used to classify families as poor or nonpoor and the tabulations that were previously made from the March sample will be repeated for households in the October sample.

The programming for the statistical matching of families has been completed and procedures have been tested using the March 1973 survey. Work is now in progress in applying this procedure to the surveys for 1969-73. Results are expected by September.

Regression Model Based on Census and CPS Data for 1969

The March 1970 CPS data were tabulated by State and estimates were obtained for each State of the proportion of children 5 to 17 years old in families with incomes below the poverty line, percent of families receiving AFDC payments, and median family income. These figures were used in several different regression models. One such model employed various 1970 census figures including the percent of children in poverty (which was used as the dependent variable), the percent urban, and the percent Negro. The per capita income for each State estimated by BEA was also used in the regression. Because of the relatively small size of the CPS sample, the 10 smallest States were excluded from the analysis.

A simple correlation analysis was made between the 1970 census estimate of the percent of children in poverty and each of the other variables that were examined in this study. As might be expected, this variable was most closely associated with the CPS estimate of the percent of children in poverty. Since poverty status is a function of income level, there was also a very close association with the CPS median family income. The lowest correlation was found with the families reporting AFDC payments in CPS. In part this may reflect the poor quality of reporting AFDC in CPS. However, it is more likely that AFDC payments, which are regulated by the States, are not closely related to poverty levels which are based on national standards.

An examination was also made of the proportion of State-to-State variation in the percent of children in poverty that can be explained when various combinations of the forementioned variables are taken into account. These results were obtained from a step-wise regression in which the variables were combined in order of their explanatory power. Since the CPS estimate of the percent of children in poverty was mostly related to

the dependent variable, it was the first variable to be used in the regression. It accounted for 84 percent of the State-to-State variation. The addition of the dummy variable for South-nonsouth residence raised this level to 90 percent. The addition of CPS median family income raised the level still more to 93 percent, and the further addition of percent Negro accounted for 95 percent of the variation. The other variables tested (percent of families with AFDC payments, percent urban, and the BEA estimates of per capita income) did not improve the explanatory power of the equation.

The following regression equation was computed based on the variables described above:

$$Y=.259 - .00002X_1 + .369X_2 + .202X_3 + .025X_4$$

$(R^2 = .96)$

(Standard error of Y=.02)

where: Y = Census percent of children in poverty

X_1 = CPS median family income

X_2 = CPS percent of children in poverty

X_3 = Census percent black

X_4 = Dummy variable for South-nonsouth residence

Although the model seems to work fairly well in producing estimates for 1969, it was not recommended for use by the Census Bureau staff. One reason for questioning its utility is that it is based on the assumption that the coefficients observed in 1969 will remain constant in subsequent years. In other words, the model assumes that the influence of each of the independent variables in determining the proportion of CIP will remain unchanged from 1969. There is reason to believe that this may not be the case. Moreover, the 1970 CPS estimates were based on the 1960 census population controls and Primary Sampling Units (PSU) definitions while the 1970 census estimates were based on 1970 census controls. The new controls and definitions were gradually phased into the CPS between 1970 and 1972. While these changes do not appear to have much of an effect on income for the total United States, changes in the PSU definitions could have an effect on State estimates. The model is based on the effect that 1970 CPS estimates had, and yet, for subsequent years the CPS estimates used in the regression analysis would be based on different controls.

Regression Model Based on Updated Census and CPS Data

Using procedures developed by Eugene Ericksen of Temple University, the Census Bureau staff has developed annual estimates of CIP that do not suffer from the defect of the census-based regression equation described above, which does not allow for change in the relationship between the dependent and independent variables. Ericksen's contribution was to study the technique of using current sample estimates of the dependent variable to determine a current regression equation with the independent variables, in place of using one fixed regression equation based upon the census.

The error in regression estimates may be decomposed into two parts—the variance and the bias. In the procedure described above, the estimates had variance because the CPS sample estimate of CIP was an independent variable in the regression and contributed variance to the regression estimates. For the regression estimates to be studied here, the CPS estimates are the dependent variable. Consequently, the coefficients of the regression model and the regression estimates themselves are subject to sampling error. Because of this, weights inversely proportional to the CPS sampling variances were used to form the regression estimates. With this weighting, the regression estimate for any given State will have a variance no greater than its CPS sampling variance and in most cases will have a variance considerably smaller. Hence, the regression estimates offer a possible way to overcome the large CPS sampling variances in small States.

Another source of error of the regression estimates is bias, the difference between the expected value of the regression estimates and the true values. The regression estimates have this source of error in common with the estimates of the preceding section. However, unlike the other estimates, the regression estimates here are computed on the basis of current estimates of the variable of CIP and, consequently, do not have the error associated with the assumption that the relationship between CIP and the predictor variables has remained fixed. Although not negligible, there is also reason to believe that the bias based on the Ericksen procedure is considerably smaller than the bias of the estimates in the preceding section.

The regression estimates based on the Ericksen procedure are formed from the weighted multiple regression of the CPS estimates of CIP on five independent variables. These five variables represent only three quantities: The 1970 census figures on 1969 CIP, the BEA values for current per capita income (PCI) for each year, and the BEA values of PCI for 1969. The use of the 1970 census values for 1969 CIP allows current sample information to determine how the basic distribution of poverty has changed between States since the census. The use of PCI for 1969 and the current year provides a measure of the change in average income for each State.

These three variables are converted into five independent variables to calculate the regression estimates: The 1970 census figures are used as one independent variable, and the two sets of PCI data from BEA are each converted into two independent variables, one for States with below average incomes and the other for States with above average incomes. This refinement was introduced because it was found in 1969, CIP decreased as per capita income increased for all States with incomes under $3,700 (roughly the poverty threshold). For the higher income States, CIP did not change as per capita income increased. Therefore, it was felt that a more accurate relationship could be obtained by fitting a separate variable to each group of States.

Below is a regression equation for 1974 estimated according to the assumptions described above. In this equation, X_1 represents census CIP; X_2 represents the difference between the logarithm of the PCI in 1969 between the median State and each State with an income above the median; X_3 represents the same variable for 1969 as X_2, but for States with incomes below the median income; X_4 and X_5 have the same meaning as X_2 and X_3 but are for 1974. When the proportion of children in poverty is expressed in thousandths and natural logarithms are used, the coefficients of the model are:

$$CIP = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5,$$

$b_0 = 3.48$, $b_1 = 0.9283$, $b_2 = 38.37$, $b_3 = 477.34$,

$b_4 = 201.79$, and $b_5 = 488.01$.

The regression estimates based on the above formulation form the main component of the current estimates. The current estimate for a given State is a weighted average of the regression estimate and the original CPS estimate. The procedure used to combine the regression and sample estimates, weights the regression estimate heavily if the anticipated bias of the estimate is small relative to the reduction in variance of the regression estimate over the original CPS sample estimate. The weights, therefore, vary from State to State. The CPS estimate forms, an important component of the current estimate only for New York and California, make minor contributions to the estimates for other large States and negligible contributions to the small States.

In view of the large sampling errors of the present CPS State estimates, the procedure described above is based primarily on the regression estimates, which, in turn largely represent an updating of the 1970 census estimate of CIP for each State adjusted by the change in average income and the current CPS estimate of that income. As the sampling errors of CPS are reduced, the CPS estimates will receive added weight in the preparation of the current estimates; however, at present they play a relatively minor role. There is a good chance that the changes in the incidence of poverty will not be closely related to the changes in average income. If that were the case, the current estimates could be seriously biased. A very interesting and important test of this possibility was devised by the Census Bureau staff. This test involves the preparation of regression estimates based on 1960 and 1970 census figures on poverty and the BEA data for 1959 and 1969. Unfortunately, the 1960 census figures for CIP were never tabulated by States. However, for 1959 and 1969, census data are available showing the proportion of low-income families (LIF) by State. For 1959 and 1969, census data along with BEA data also are available for LIF and CIP by the 100 largest SMSA's in 1960. These are available according to the 1960 SMSA boundries.

Regression estimates were prepared using a poverty measure in 1969, a proverty measure in 1959 and four additional independent variables formed from the BEA data for these years. For SMSA's, the median value of the 100 SMSA figures from BEA was used in place of the State median. The logarithm of income was used in all cases.

When the 1969 LIF for States was estimated using only the 1959 estimates of LIF, the proportion of variance explained was measured by an R^2 of .90. This figure was raised to .96 when the logarithms of the 1959 and 1969 PCI were added. The split of the PCI figures to reflect States above and below the median State income for each year further improved the fit, raising R^2 to .98.

When the 1969 LIF was estimated from the 1959 LIF for the 100 largest SMSA's, the proportion of variance explained was measured by an R^2 of 83 The same procedure used to estimate CIP for the 100 largest SMSA's yielded an R^2 of .78.

The experience with the 1959 and 1969 LIF figures for States indicates that a linear transformation of the 1959 values is the most appropriate functional form to fit to the current data.

There is a possibility that the close relationship between changes in the poverty rate and in average income observed during the sixties may not be so close today. A weakening of this relationship may be expected because of the way the variables are defined. Year-to-year changes in average income reflect changes in productivity as well as prices. The income of the average family tends to increase over the years because of increases in the output of goods and services per man-hour of work and increases in prices and wages. In contrast, the change in the poverty line each year reflects only the increase in prices. During the sixties, the poverty threshold was much closer to the average income than it is today. During the earlier period, therefore, it is more likely that changes in the average income level would correspond more closely with changes in the poverty line than would be the case today.

In order to test this hypothesis, a simple correlation was made of the relationship between the percent of children in poverty and median family income using CPS data. When the data were tabulated for all States, the correlation ratio ranged from .64 to .78 during the three-year period from 1967 to 1970; in 1971, this ratio dropped to .42. The data for all States were not tabulated for 1972 or 1973. A similar test was made using the 16 largest States plus Maryland, Minnesota, and Washington, which rank 19, 20, and 22, respectively, in terms of size. These States were selected initially because BLS has published unemployment rates for them for 1968-73 and an examination was made of the relationship between unemployment and the incidence of poverty. The correlation ratio(s) between median family income and the percent of children in poverty for these 19 large States was about .80 in 1968 and 1969; it dropped to .66 in 1970; and dropped to about .54 in 1971 and 1972. In 1973, this ratio rose again to .61, but it was still far below the level reached during the latter part of the sixties. This evidence suggests that there has been a weakening of the correlation between the poverty rate and average income in recent years. Further tests are contemplated to see if the relationship between the poverty rate and other points on the distribution (e.g., the quintile value) has been more stable.

REGRESSION ESTIMATES BASED ON IRS DATA: 1969

The Census Bureau has prepared a file in which tax returns have been located for households in the March 1972 CPS and the two records have been merged. By the use of this file, it is possible to identify all tax returns which have one or more children in poverty. A tabulation was made of tax returns classified by adjusted gross income level and by type of return and number of child exemptions. The outline of this tabulation is shown on page 44.

For each cell in the above matrix, a tally was made of the number of tax returns with children in poverty and the total number of tax returns. This tally provided a ratio for each cell which was used to tabulate against the 1-percent IRS file, classified by State and county. This tabulation provides, for each State and for the larger counties, estimates of the proportion of tax returns with children in poverty.

The 1-percent IRS file for 1969 was tabulated by type of return, number of exemptions, and adjusted gross income for States and counties. The poverty ratios based on the March 1972 CPS-IRS matching study were applied to that tabulation.

If all families were represented on tax returns, the task would be complete at this point and all that would be required would be an analysis of differences. However, the task is far from complete because many families do not file tax returns and the failure to file returns varies from place to place. Therefore, it was anticipated from the outset that the procedure would need

Type of return and number of child exemptions	Adjusted gross income						
	Under $1,000	$1,000 to $1,999	$2,000 to $2,999	$3,000 to $3,999			$25,000 and over
Joint return							
Exemptions:							
0							
1							
2							
3							
4							
5 or more							
Head of household return (by number of exemptions)							
Survivors special return (by number of exemptions)							
Single person return (by number of exemptions)							

modification. Stated differently, the total estimate of the number of children in poverty based on the census and IRS matching procedure consists of two parts: First, children in poverty based on tax returns and children in poverty based on other sources ($CIP = CIP_{tr} + CIP_{ntr}$). The second component would have to be estimated by other means. Before turning to the procedure for estimating the second component (CIP_{ntr}) an examination of the tax return data for 1969 showed that about 80 percent of all poor children in the United States were in families which filed tax returns. As might be expected there were wide variations in this proportion among States. Only between 60 to 70 percent of the total number of poor children were in families which filed tax returns in such low-income States as Alabama, Georgia, Louisiana, Mississippi, and South Carolina. The reasonableness of the estimates ends there. In 14 States, more than 100 percent of the Census Bureau estimate of the number of poor children were reported on tax returns. These States included such diverse places as Idaho, Iowa, Maine, Minnesota, Montana, Nebraska, Nevada, New Hampshire, North Dakota, South Dakota, and others. Moreover, we find that in some high-income, industrialized States such as California, 97 percent of the poor children were reported on tax returns as compared with 78 percent in New York. These wide unexplained aberrations immediately cast doubt on the validity of the procedure.

It was intended that the second component of the estimate would be derived by comparing the Census Bureau and the IRS estimate of the total number of children. It was assumed that the Census Bureau figure would be higher than IRS and that the difference would largely represent children in poor families which did not file tax returns. However, when the results were examined it was found that the total number of children was about the same in census and IRS, leading to the unreasonable conclusion that there were no poor children in families which did not file tax returns. In light of the unreasonable results obtained in both components of the estimating equation, it was decided that this procedure could not be used to estimate the number of children in poverty for States and counties.

There are undoubtedly several reasons for the failure of the census and IRS matching procedure to produce better State estimates of the number of poor children. Children may be overreported on tax returns for the purpose of increasing the number of exemptions or they may be missed in the census. The application of poverty ratios for each adjusted gross income class based on a small national sample may not hold up well when applied to individual States. A critical factor may be the difference in the definition of children in the two sets of data. Children are defined in the census as persons in the household who are under 18 years old and are related to the head of the household. On tax returns, children are defined as dependents under 19 years old who may or may not be living in the household, and as dependents 19 to 22 years old who are living at home and are attending school. Consideration was given to the development of adjustment factors which would bring these two concepts into closer agreement. However, these factors would have to be developed from national data and there would undoubtedly be large State-to-State variations in the extent to which college students stay at home while attending school.

ESTIMATES BASED ON UPDATING A 1969 MATRIX BY SIZE OF FAMILY AND INCOME

This work is being performed by the Regional Economic Analysis Division (READ), in the Bureau of Economic Analysis of the Department of Commerce and is an outgrowth of their studies on the preparation of current income distributions for States. The first step involves the preparation of the matrix shown on page 45 for each State in 1969. This information has been published by the Census Bureau.

The second step requires the preparation of an estimated income distribution for each State of all families by income levels for 1973 and a distribution of all families by size of family for 1973 (the rim totals of the above matrix). The income distributions will be prepared by READ using Department of Commerce data. The size of family distributions are

Income level in 1969	Size of family in 1969							Estimated number of families, 1973
	2	3	4	5	6	7+	Total	
$10,000 and over...								
Under--								
$10,000.....								
$9,000.....								
$8,000.....								
$7,000.....								
$6,000.....								
$5,000.....								
$4,000.....								
$3,000.....								
$2,000.....								
$1,000.....								
All families, 1969.								
Estimated number of families, 1973.								

based on tabulations of CPS data by State for 1967-73. After the rim totals have been prepared for each State, the 1969 matrix will be converted to a 1973 matrix of families by size of family and income level, based on the rim total and the internal relationships of the matrix for 1969. The income distribution for 1973 will reflect disparity in economic growth among States between 1959 and 1969.

Based on published data the following ratios will be prepared for each State:

$$\frac{C_{69}}{F_{69}}$$

C_{69} = Number of children 5 to 17 years old in poverty

F_{69} = Number of families below an arbitrary income point, e.g., $5,000

Based on the estimated 1973 matrix, the ratios shown below will be prepared, with the variables defined above, but for 1973. These figures will be based on estimates of the average number of children 5 to 17 years old per family of a given size.

$$\frac{C_{73}}{F_{73}}$$

The operations provide directly for each State, estimates of the number of poor families by size of family, the number of children 5 to 17 years old living in these families, and the number of families having incomes less than a specified amount (to be used in preparing the county estimates described below).

Based on published census data the ratio shown below will be prepared for each county for 1969, where the variables are defined as above, but are for counties rather than States.

$$\frac{c_{i69}}{f_{i69}}$$

An estimated income distribution will be prepared for 1973 for each county (using procedures analogous to those described for States above). An estimate will than be prepared of the number of poor children for each county in 1973 based on the following relationship.

$$\begin{bmatrix} \frac{C_{69}}{F_{69}} \\ \\ \frac{c_{i69}}{f_{i69}} \end{bmatrix} = \begin{bmatrix} \frac{C_{73}}{F_{73}} \\ \\ \frac{c_{i73}}{f_{i73}} \end{bmatrix}$$

READ has made several computer test runs showing the estimated number of children in poverty, by State, for 1973. The procedure is still in the developmental stage so none of the estimates can be regarded as final. These estimates are based on a procedure in which the 1970 census data on families cross-classified by size of family and size of income were projected to 1973 on the basis of (1) the change in the number of families by size of family based on CPS and (2) the change in the distribution of families by income level based on changes in the Lorenz curve between 1960 and 1970 and on the change in the median family income as measured by CPS in 1969-73. These estimates were compared with the estimates for 1973 prepared by the Census Bureau using the Ericksen procedure.

There is very close agreement between the Census Bureau and the READ estimates in the 12 largest States (those with 5 million or more people). The average difference for all of the States in this group is less than 1 percentage point. In four of these States the estimates agree exactly, in six more States they differ by only 1 percentage point, and in the two remaining States the difference is 2 percentage points.

There is also close agreement between the 2 estimates in the 12 moderately large States (those with 3 to 5 million people); however, the differences are considerably greater than those noted above. The average difference within this group is about 2 percentage points. The 12 States within this group can be subdivided into 4 subgroups of 3 States with differences of 0, 1, or 2, 3, and 4 percentage points.

Differences of the same order of magnitude can be observed in the 14 moderately small States with 1 to 3 million inhabitants. Here again, the average difference is about 2 percentage points. There is exact agreement in only one State; five States have differences of 1 percentage point, two States have differences of 3 points, and three States have differences of 4 points or more.

As might be expected, poorest agreement is found for the 13 smallest States with less than 1 million inhabitants. The average difference for these States is 5 percentage points. In this group there are no States with exact agreement and only one State with a difference of 1 percentage point. Nine of the 13 States in this group have differences of 4 percent or more. Hopefully, the marginal error will be reduced for this group of States as work continues on the project.

Since the READ and the CPS estimates are entirely independent, it may be of interest to compare the results. The differences are considerably greater than those noted above in the comparison of the READ and the census results; however, they are much less than might be expected in view of the small size of the CPS sample in many States. There is a very wide discrepancy between the 2 sets of figures for the 13 smallest States, due undoubtedly to the very large sampling errors associated with the CPS estimates for those States. It is surprising to find, however, that there is relatively close agreement between the two sets of figures for many of the other States. The average difference between READ and CPS for the 12 largest States was about 2 percentage points. The 14 moderately small States had about the same average difference; and the 12 moderately large States had a difference of about 3 percentage points, if we exclude Alabama for which the READ estimates seems to be entirely out of line. Hopefully, the supplementation of the CPS in the smaller States will bring the estimates into even closer agreement.

Comments

G.E. Alan Dever
Georgia Department of Human Resources

The arrangement of these papers on the program for presentation appears to reflect a progression of needs for many programs, not only the Title I Elementary and Secondary Education Act. Such needs are data requirements, data collection, and data analysis. Thus, Ginsburg focuses on data requirement by exploring previous pitfalls, and suggests future guidelines in the area of communication between policymakers and/or decisionmakers and the persons responsible for data collection. Wray Smith, in his paper, makes a strong case for additional data collection via a new data system labeled the Survey of Income and Education (spring 1976). The final paper by Miller and Kahn uses the traditional regression model for data analysis in order to estimate the number of children in poverty for States.

My initial response is evoked by what Ginsburg expressed as the need for data users, data collectors, and data analyzers to communicate with each other. However, I wonder if, in the preparation of these papers, there was communication among the authors to overcome this problem.

First, let me say it is refreshing to see such significant activity and concern for the disadvantaged students—especially in low-income families. I believe Ginsburg and Cooke succinctly express the alternatives for the distribution of funds relative to the education act (title I). Further, the Federal poverty index best describes the need in terms of several variables; and I would have to agree that if we follow this line of analysis the difference in living costs must be considered. In fact, this may be the most critical measure. If we view education as the delivery of a public good or service, then many of the differences that exist between the "haves" and the "have-nots" may dissipate. And if this occurs, our data needs become those, not of identifying thresholds for priority levels to equitably distribute funds, but rather of identifying the number of children in respective age groups who will receive education as a public good. It should be noted that the disadvantaged population is characterized by other social problems which need similar and comprehensive treatment.

Under present plans we are faced with a systems problem that requires the optimization of resources on a geographic distributional basis. This raises two issues: First, the need for disaggregation of data by very specific variables to best determine poverty thresholds; and second, the need to identify these families and children, spatially and temporally, with consistent accuracy. These points were well stressed by Ginsburg and Cooke. I believe, however, the major impact of this paper is the recurrent theme of the need for data that relates to policy decisions. I consider this a most basic issue that never seems to be resolved between the policy decisionmakers and the data-collectors. One final point on the Ginsburg and Cooke paper: If we have $2 billion for distribution from title I, aren't we putting the cart before the horse? Wouldn't it be better to know how many horses we have and then barter for the carts?

Smith's paper elicits a rather paradoxical situation relative to data needs surveys, and samples. I believe most researchers would agree with the fact that we are in an era of information and data overload. However, we still hear the call for more data and, I suppose, for more information. The Survey of Income and Education (spring 1976) is stated to have potential by Smith. This I agree with, but to develop fully to potential of this new data set, I feel we must bring the policymakers together with the data-collectors. This is point, that Ginsburg and Cooke say may approach an impracticality. Smith clearly demonstrates the opportunities for the planners with the new proposed data sets. I might add that the new data could have significant use in health programs for planning, evaluation, and research. However, with only a sample of 5,000, I question the utility of the new information to be of practical value to the States in the area of health planning.

Smith's point on Federal research councils makes me a bit apprehensive of their future role. Specifically, it appears to be a centralization of functions that usually creates authority but not necessarily the responsibility.

Miller and Kahn provide three interesting procedures that rely heavily on regression approaches. My initial response to this paper relates to the problems of estimates at the State level of analysis. Consistent with most analysis of this type, two problems exist. One, the difficulty of making allocations on a State basis when, in fact, areas within the State are dramatically different in terms of estimating characteristics. However, the attempt to overcome this difficulty will be somewhat removed when they provide their regression estimates for the largest 123 SMSA's (standard metropolitan statistical areas). Two, in discussion, they point out that a simple realignment of the formula or equation could change the allocation from being directed to the affluent States to the deprived States. I say it is time to reevaluate allocation procedures so areas that traditionally get more money should be equitably adjusted, and so the deprived areas are able to aspire to new levels of educational development.

Finally, I applaud the efforts and the direction of all these authors, and I hope the fruition of this meeting produces many rewards to our educational systems.

☆U.S. GOVERNMENT PRINTING OFFICE

CENSUS TRACT PAPERS

Series GE-40

No. 1. Papers Presented at the Census Tract Conference, September 10, 1965, Philadelphia, Pa.
No. 2. Needs and Plans for the 1970 Censuses (Census Tract Conference of August 15, 1966, at Los Angeles, Calif.)
No. 3. Some Uses of Census Tracts in Private Business, by Wilbur McCann (1967)
No. 4. Papers Presented at the Conference on Small-Area Statistics, American Statistical Association, Washington, D.C., December 27, 1967, and Related Papers
No. 5. Papers Presented at the Conference on Small-Area Statistics, American Statistical Association, Pittsburgh, Pa., August 23, 1968, and Related Papers
No. 6. Final 1970 Census Plans and Four Programing Systems for Computerized Data Retrieval and Manipulation (Conference on Small-Area Statistics, American Statistical Association, August 21, 1969, New York, N.Y.)
No. 7. New Uses of Census Resources, The Southern California Census Use Study and a Related Paper (Conference on Small-Area Statistics, American Statistical Association, December 29, 1970, Detroit, Mich.)
No. 8. Small-Area Statistics: Strengthening Their Role in Federal Government and Their Use in Criminal Justice Programs (Papers Presented at the Conference on Small-Area Statistics, American Statistical Association, August 23, 1971, Ft. Collins, Colo.)
No. 9. Social Indicators for Small Areas (Papers Presented at the Conference on Small-Area Statistics, American Statistical Association, August 14, 1972, Montreal, Canada)
No. 10. Statistical Methodology of Revenue Sharing and Related Estimate Studies (Papers Presented at the Conference on Small-Area Statistics, American Statistical Association, December 27, 1973, New York, N.Y.)

Copies of early editions are no longer in print but may be available in Federal Depository Libraries. Papers presented at conferences held from 1958 through 1964 were originally published by the Bureau of the Census in its Working Paper Series.

SMALL-AREA STATISTICS PAPERS

Series GE-41

No. 1. Intercensal Estimates for Small Areas and Public Data Files for Research (Papers Presented at the Conference on Small-Area Statistics, American Statistical Association, August 26, 1974, St. Louis, Mo.)
No. 2. Business Uses of Small-Area Statistics and Education's Needs and Methods for Estimating Low-Income Population (Papers Presented at the Conference on Small-Area Statistics, American Statistical Association, August 25, 1975, Atlanta, Ga.)

For Information on any of these reports, write to:

Subscriber Services Section (Publications)
Bureau of the Census
Washington, D.C. 20233

U.S. DEPARTMENT OF COMMERCE
Bureau of the Census
Washington, D.C. 20233

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE
COM-202

OFFICIAL BUSINESS

SPECIAL FOURTH-CLASS RATE
BOOK

UNIVERSITY OF ILLINOIS-URBANA
3 0112 084237731